Anxiety and Learning/Response Behaviour in the Context of Intellectual Problem Solving by Young Children

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ABSTRACT

Twenty-eight grade four students were categorized as either high or low anxious subjects as per Gillis' Child Anxiety Scale (a self-report general measure). In determining impulsivity in their response tendencies, via Kagan's Matching Familiar Figures Test, a significant difference between the two groups was not found to exist. Training procedures (verbal labelling plus rehearsal strategies) were introduced in modification of their learning behaviour on a visual sequential memory task. Significantly more reflective memory recall behaviour was noted by both groups as a result. Furthermore, transfer of the reflective quality of this learning strategy produced significantly less impulsive response behaviour for high and low anxious subjects with respect to response latency and for low anxious subjects with respect to response accuracy.

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CHAPTER I - INTRODUCTION TO THE STUDY

(A) INTRODUCTION

(1) Statement of the Problem:

The field of educational psychology is inclusive of numerable sub-categories which assist in explanation of the learning patterns of children. Intellectual performance does not occur by accident, nor is it a simple process. Rather, it is the product of a number of intervening factors. One specific measure of intellectual activity which has been studied in depth involves successful or unsuccessful performance of students in problem solving situations. The relationship between learning and response behaviour represents one area within the problem solving context. This relationship (characterized by impulsive or reflective tendencies) in young children denoted as high or low anxious subjects has been selected for examination in the present study.

Janis, Mahl, Kagan and Holt (1969) list several conditions as being most influential in promoting the quality of performance on intellectual problems. These may be categorized as one of three groups:

-elemental cognitive units
-cognitive processes
-motivation/inhibition

Elemental cognitive units refer to images, symbols (both

words and numbers), concepts and rules which have previously been acquired through experience and associations. The degree to which a child has practised and refined these basic tools will directly correlate with the way he/she interprets the environment. Information which is meaningful to him/her (i.e. it is at an equitable level or only slightly advanced from his pre-established set of images, symbols, concepts and rules) tends to be processed efficiently. However, if he/she is confronted with a totally new stimulus and is unable to connect the incoming ideas with his/her cognitive units, very little information will be retained (Janis et al., 1969).

Children will label and interpret information differently. Since the human biological receptors of information remain constant among individuals, the observed differences in encoding experiences may lie in the cognitive units used to interpret incoming information (Janis et al., 1969). There is a maturational component related to these differences, as a very young child appears to encode and process information in a different manner than either adolescents or adults (Sternberg and Rifkin, 1979). However, consider children who are compatible in age and mental ability. Are their strategies of encoding and processing information the same? Theorists such as Kagan (1966) and Kagan, Rossman, Day, Albert and Phillips (1964) have replied in the negative, contending that some children employ global methods of processing a visual stimulus, whereas others perceive such in a more detailed and analytic manner. Janis et al.'s (1969) analogy of "an analytic child would see the trees whereas the global child would see the forest" (p. 533) provides an illustration of the differences that may exist. The former strategy is more refined and

precise.

An accurate means of measuring global and analytic information processing is by examining a child's tempo of response (Kagan, 1966). This involves the relationship that exists between the speed in which a child decides on a correct label for an object or a correct formula for a problem, and the accuracy of his response based on this decision (Janis et al., 1969). Jerome Kagan has labelled these as the distinguishing features of reflective and impulsive children. An instrument which he has devised (the Matching Familiar Figures Test) has become the standard means of measurement (Zelniker and Jeffrey, 1976) for the impulsive-reflective domain. A detailed explanation will be devoted to this instrument and its present application in Chapter III of this text.

The final influence on performance of intellectual problems to be considered involves the triadic combination of motives, expectations and sources of anxiety or conflict. The intertwining of these factors tends to either propel or inhibit strategic learning behaviour (Janis et al., 1969). One who has experienced past successes in solving problems of an intellectual nature tends to be more motivated to attempt similar problems in the future (Janis et al., 1969, Combs et al., 1976).

Repeated failure may lead to increased anxiety in a similar task. This elevated anxiety level, in turn, tends to impede investment of effort to the task at hand (Janis et al., 1969), perhaps even promoting feelings of helplessness (Seligman, 1969). The child who expects success will go to great lengths to assure that he attains success (Purkey, 1970) in problem solving behaviour. The cyclical effect of success and his motive to master this

specified problem will be strongly influenced by the degree in which he expects to be successful. Expectancy of failure, conversely, has an opposite multiplying characteristic (Janis et al., 1969).

(2) Rationale for the Present Study:

Within the context of these conditions governing the quality of an individual's response in a problem solving situation, the present study has been undertaken. Regarding the effect on inhibition or motivation of response tendencies, high anxious and low anxious subjects are studied. Based on an associated review of the literature (see for example Sarason, 1960; Parsons, Peterson and Davids, 1968; and Gillis, 1980) anxiety, at an elevated level, may affect academic performance in general, as well as problem solving ability of children (Kauffman, 1980).

The actual process of problem solving may be considered as:

> "thinking that is directed toward the solving of a specific problem that involves both the formation of responses and selection among possible responses," (Solso, 1979, p. 373).

An individual will develop a response strategy, which leads to the choice of potential responses and ultimately to a test of the responses in solving the problem at hand. Previous work has dealt with the occurrence of a solution to a problem. Examination of the underlying cognitive structure accounting for the solution is limited. Although the importance of observing the final response is readily recognized, it may similarly be considered insufficient.

The present study represents an attempt to examine the

information processing variance which exists among similarly grouped children. The noted differences are derived on the basis of impulsive or reflective tendencies in situations which require response uncertainty. The assessment of an individual's problem solving ability as affected by his related anxiety level will be determined. As modification of learning behaviour is an important component of the present study, additional research will delve into the transfer of learning behaviour strategies to response behaviour.

(B) ANXIETY AND LEARNING

(1) Definition of Anxiety:

Goldenson (1970) has defined anxiety as "a diffuse feeling of dread, apprehension and impending catastrophe" (p. 90). As a reaction, it differs from fear in that the cause of fear is perceived as external. In the case of anxiety, its source is predominantly internal and largely or completely unrecognized (Goldenson, 1970). Since the logic underlying one's anxiety is not readily apparent it seems out of proportion to any observable cause. This may be due to the fact that the response has arisen from situations deeply instilled in one's personality. These situations may include unresolved conflicts or bothersome memories which are personally threatening to one's self-esteem and well-being (Goldenson, 1970). This component of prior history of unsuccessful experiences in academic achievement has also been noted as accountable for heightened anxiety in problem solving related tasks.

Anxiety has been classfied as either state or trait in nature. State anxiety is momentary or transient, and varies in

its intensity on selected occasions. An alternate categorization, trait-anxiety[1], represents a personality characteristic which is relatively constant over time, and is little affected by circumstantial situations (Spielberger, 1976). State anxiety is particularly vulnerable to fluctuations if the afflicted individual correlates his performance (perhaps expected failure) on a specified task to his own intelligence or other desirable personal characteristics (Finch et al., 1978). Situations which propel a direct or implied threat to one's self-esteem lead to an increase in state anxiety (Finch et al., 1978).

Instrumentation has been devised to measure either of these types of anxiety (e.g. Spielberger, 1973 - The State-Trait Anxiety Scale for Children) which recognizes these two separate measures as having important distinctions. It has also been established that both traits and situational factors influence human behaviour. However, because of a lack of specificity which characterizes trait measures, the quality of their usefulness is questionable (Spielberger, 1977). There is little evidence as to consistency of varied studies which can be directly attributed to personality trait measures, as behaviour changes from one situation to the

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[1]The viewing of trait anxiety is taken from opposing positions with respect to its dimensional properties. Hodges and Speilberger (1969) concluded that state anxiety accounts for the differences which exist among individuals on memory and learning tasks. This recognizes trait anxiety from a unidimensional perspective. Endler and Okada (1975) however view trait anxiety as multidimensional, in that individuals vary not only in their susceptibility to anxiety states, but also on the quality and quantity of the environmental situation that is likely to produce state reactions. Thus it is necessary that the threatening situations be congruent to the personality trait which is being considered (Finch et al., 1976). Differences are then seen to exist, based on the manner in which individuals perceive anxiety provoking milieux. This latter explanation is biased toward the study of one's behaviour (in this case anxiousness) as a product of an individual's personality and his environment. Its allowance for a more differential approach to the examination of attitudinal behaviour (Hunt, 1979) is favoured by this researcher.

next (Spielberger, 1977). From this point of view, a trait measure of anxiety in isolation seems to be less accurate than a state or situation/behavioural measure.

The nature of the questionnaire used in this experiment seems to favour a generalized measure, as the items span various circumstantial situations. They appear to be neither state nor trait specific. Replies can subsequently be analysed as mirroring either high anxious or low anxious children with respect to established norms of anxiety levels.[2]

Zelniker and Jeffrey (1976) have determined that reflective behaviour of students is conducive to the acquisition of learning skills. Similarly, Sarason (1960) has found elevated anxiety levels to be a negative influence on intellectual productivity and problem solving ability. Extension of this concept would propose that a heightened anxiety level would impair the reflective behaviour of those students. The assumption of this hypothesis is that subjects experiencing critical levels of anxiety will respond to intellectual problem solving tasks in an impulsive manner, hence more quickly and with less accuracy.

(2) Anxiety and Learning Behaviour:

It has been noted that impairment in efficient learning of intellectual skills and the employment of new knowledge in problem solving tasks may be attributed to heightened anxiety. Understanding of motivation as a facilitator to learning behaviour, or anxiety as a deterrent to learning behaviour is assisted if it is explained how this occurs.

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[2]The anxiety measurement which has been selected for use in the present experiment is the Child Anxiety Scale (Gillis, 1980). Its reference will hereafter be denoted as C.A.S.

Janis et al. (1969) have considered several sources of anxiety which may impede learning behaviour. Expectancy of failure (discussed earlier) tends to impede investment of mental energy into intellectual functioning. Other sources of anxious behaviour present in an educational milieu include a child's hostility toward his parents or teacher, excessive competitiveness of the learning environment, peer rejection or the promotion of a passive role to be assumed by students (Janis et al., 1969).

The common element among all five of the situational occurrences involves a cause-and-effect circumstance. There seems to be a direct correspondence between the degree of anxiety a student maintains in academic related situations and his resultant learning behaviour. The anxiety experienced by an individual in reflecting on the learning situation and his own behaviour seems to influence his impulsiveness in developing recall accuracy and response tendencies. Clearly, as Janis et al. (1969) have suggested, contiguity of events alone does not account for intellectual learning which takes place. Contributing factors, of which anxiety appears to be included, are also influential in determining the personal investment in intellectual activity. On this basis, more impulsive, inaccurate strategies for learning will generally be maintained by higher anxious students (Finch et al., 1978, Janis et al., 1969).

(3) Impulsive Learning and Impulsive Responding as a Behavioural Index of Anxiety:

Finch and Montgomery (1973) have considered Kagan's (1966) reflective-impulsive classification as being appropriate. A related study has shown that heightened anxiety, in addition to locus of control (i.e. subjects who are more external in nature)

has been associated with impulsive behaviour (Ollendick et al., 1976). Those in possession of these qualities employed a less efficient approach to problem solving and formulated responses in a more immature manner, often inserting "guesses" in pursuing their task solution. Consequently, higher anxious subjects responded more quickly and less accurately on tests of response behaviour (Ollendick et al., 1976). Based on such published literature, a link between anxiety and impulsive response behaviour may be established.

In addition, anxiety is influential in determining successful intellectual performance. Sarason et al. (1964) have determined that "children's anxiety scores are negatively related to indices of intellectual and academic performance" (p. 34). Intellectual performance in the problem solving domain refers specifically to response characteristics and learning behaviour of the students involved. Kauffman (1981) considers that it is very conceivable that anxiety at extreme levels could lead to less effective learning strategies and impulsive response tendencies.

Impulsivity has been characteristically defined in terms of aggression, deficient moral development, hyperactivity and problems in attention (Kauffman, 1981). Within the context of this study, impulsiveness is best considered as a cognitive tempo that hinders academic performance.[3]

Kagan et al. (1964) and Kagan (1966) conclude that impulsive selection of a hypothetical solution will lead to inaccurate

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[3]Academic performance in this regard is measured as the manner in which a child attends to intellectual problem solving strategies.

performance. There is a consistent tendency for individuals to respond either slowly or quickly to a problematic situation and correspondingly with either a high or low accuracy rate in situations requiring response uncertainty (Zelniker and Jeffrey, 1976)[4]. As one behavioural index of anxiety, performance of an intellectual problem solving nature in that higher anxious students have more impulsive tendencies, may be considered suitable (Murphy, 1980).

(C) HYPOTHESIS OF THE PRESENT EXPERIMENT

The setting for this experiment is compatible among the subjects with respect to grade level, intelligence grouping and geographical drawing area (reflecting a stable social and cultural bias). Determination of the independent variable, anxiety, was measured using the Child Anxiety Scale (Gillis, 1980). Further experimentation will determine the relationship between this attribute (anxiety) and a child's reflective/impulsive tendencies. This dependent variable involves two aspects in the problem solving area:

(a) the examination of a subjects' responses with respect to response latency and accuracy.

(b) the measure of a subject's spontaneous use of reflective

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[4]This proposition assumes that the competence displayed for problem solution cannot be accounted for by I.Q. differences or verbal ability. Any one, or a combination of, conceptual ability, motivation, capacity to reflect on the adequacy of one's solution, may underlie the discrepancy that exists in successful problem solving by children (Kagan, 1966). The argument put forth by this researcher examines the most latter, maintaining the assumption that conceptual ability of subjects in the study is relatively constant.

abstraction[5] to restructure his/her learning strategies. This component will be examined prior and subsequent to introduced training procedures by the experimenter.

Kagan's (1966) Matching Familiar Figures Test (MFF) and one component of the Kirk et al.'s (1976) Illinois Test of Psycholinguistic Abilities (the Visual Sequential Memory Test) will be administered as measurement of the dependent variable. This instrumentation will be more elaborately discussed in Chapter III.

The initial hypothesis to be accepted or rejected may be stated as:

(a) A general measure of anxiety, as per the C.A.S., will be related to the degree of impulsive response and learning behaviour of children, in that high anxious subjects should be more impulsive than low anxious children.

As an outgrowth from this initial hypothesis, two associated hypotheses are included:

(b) High anxious children will be able to acquire reflective learning behaviour and the related strategies should transfer to their problem solving response behaviour.

(c) A control group of low anxious subjects will evidence lower levels of impulsive behaviour and will correspondingly produce less improvement and transfer as a result. Some improvement in both response latency and accuracy on behalf of the low anxious subjects is not, however, to be ruled out.

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[5] In this regard, Piaget (1976) refers to "reflective abstraction" as the process of reflecting on or examining one's past behaviour and subsequently modifying it based on the success or failure of this reflection. It requires a conceptual frame of reference which can be subsequently adapted in a pragmatic manner. A detailed discussion of the role of "reflective abstraction" in the modification of learning behaviour is presented in Chapter II.

CHAPTER II - REVIEW OF RELATED LITERATURE

(A) INTRODUCTORY DISCUSSION

(1) Anxiety Related Behaviour (Reflective/Impulsive Domain):

The initial intent of this experiment is to examine anxiety related response and learning behaviour. Specifically, the delineation of high anxious subjects' tendencies of impulsive behaviour and low anxious subjects exhibiting reflective behaviour will be determined. Associated experimentation will evaluate the effectiveness of modification of learning behaviour with respect to both groups, and its transfer to a response condition.

Numerous studies have examined the impulsive-reflective domain under a variety of circumstances, in attempt to measure cognitive or problem solving strategies which are apparent. Odom et al. (1971), Nuessle (1972) and Siegel et al. (1973) discovered that reflective children focused much of their attention to finely detailed and relevant features of administered items. Impulsive children tended to view similar items in a more global manner, thus increasing their error factor. Through experimentation, impulsives proved to be significantly more accurate on global problems than on those requiring detail, whereas reflectives experienced a higher error rate on the global measures (Zelniker and Jeffrey, 1976). In addition, reflective

children have been reported to process their information more efficiently (Epstein et al., 1975) which in turn promotes effective hypothesis evaluation and ultimately problem solution.

The performance of reflectives has been proven superior to impulsives on tests of intelligence and achievement, as well as general success in the early grades (Egeland and Higgins, 1976). It has subsequently been suggested that impulsive students make more errors in reading and comprehension of prose, they are more likely to offer incorrect solutions to inductive reasoning problems and visual discrimination tasks, and their error rate is elevated on serial recall tasks (Kagan et al., 1966). Regarding tasks of central and incidental information recall[6], impulsive children recalled less of both types of information than did reflective children (Egeland and Higgins, 1976). In general, they seem to care less about making academic type errors, as their desire to respond quickly nullifies their desire to respond accurately. From a practical viewpoint, the impulsively reacting student often is faced with ridicule from his peers and intolerance from his teachers (Kagan et al., 1966). In summation, these findings suggest that reflective children generally have higher

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[6]Pertinent to the present study is the assessment of central and incidental information. In a stimulus-response display, Egeland and Higgins (1976) have accounted for this differentiation on the basis of focused attention. Retaining incidental or circumstantial characteristics of a display is known as incidental learning, whereas selective attention to specific task relevant information is referred to as high central learning. The ability to discriminate and retrieve from one's long term memory storage are both required in central information processing. Hagen (1967) has reported that as a child matures, he tends to engage in more refined central task performance, decreasing his incidental mode of processing. This suggests that success in task performance can be somewhat attributed to the development of recall of central information.

standards of task mastery, they tend to score at elevated levels on sustained attention measures and teachers' ratings of attention span, and they seem to employ a more systematic and efficient scanning strategy (Zelniker and Jeffrey, 1976). Undoubtedly, in an educational interest, reflection has been evidenced as a positive attribute.

The indexing of anxiety may be arrived at through either a self-report manner or via observed behaviour. In the present testing, state measure of specific reactions would be cumbersome to construct in relation to the MFF test and the Visual Sequential Memory Test of the I.T.P.A.[7] Given the previous indication that accuracy of trait measures of anxiety are also suspect (Spielberger, 1977), it was decided that a self-report measure of general anxiety arrived at through the use of Gillis' (1980) C.A.S. would be applicable in the present experiment.

(2) Information Processing and Impulsive/Reflective Behaviour:

An understandable approach to problem solving begins with a basic knowledge of the mental processes that an individual experiences in programming information received from his environment. The individual must effectively attend to, perceive, and further seek out relevant information (Solso, 1979) in attempt to accommodate a satisfiable solution to the task at hand. This involves the extraction and organization of information from the environment (Farnham-Diggory, 1978). Inherent in this process

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[7]The subject matter discussed would, in all probability be difficult for the students to accurately report on, as its nature is dissimilar to other academic related tasks with which they would be accustomed. This would hinder an appropriate state designed measure of anxiety.

is the use of one's memory capacity, of which there are two types, (a) short term memory storage (STM) and (b) long term memory storage (LTM).

Farnham-Diggory (1978) describes information processing in a flow-chart schema. She states that one does not initially perceive an entity in a global manner, but rather specifically detects its aspects (referred to as features). The sensory mechanisms through which this is grasped, include definite visual, auditory and tactual information receptors (Farnham-Diggory, 1978). Buffers are hypothesized, which serve as retention mechanisms for the initial sensory information which is being processed. Thus, information previously examined can be stored, allowing an individual's attention to be focused on the remaining features of the entity which is under consideration. The addition of incoming information with previously established information allows the integration of newly perceived data. The short term memory functions as a central processor through which all input and output to and from an individual's knowledge base (long term memory) must pass (Allport, 1980). Within the short term memory, there exists a specialized form of memory, the working memory, which stores relevant incoming information.

Information processing strategies (examination of detail) may be approached differently by impulsive and reflective children. Zelniker and Jeffrey's (1976) suggestions that the difference between impulsive and reflective children are mainly qualitative, is in contrast to Kagan et al.'s (1964) proposition that both types of children approach a problem in a similar manner, but differ in their choice of attending their skills to

the task at hand. Zelniker maintains that reflectives form an analysis of information into component details whereas impulsives look upon the task as a whole. In her estimation the effect of motivation is minimized in favour of the child's actual capability of analysis. Kagan, on the other hand, has suggested that a child's preferred strategy is due to his own choice, and that a cognitive link between one's impulsive behaviour and one's information processing is not evident. He furthers this point through contention that if sufficiently motivated, reflectives and impulsives would be capable of utilizing either strategy (Loper et al., 1982).

It has been documented that children who are classified as impulsive have performed more quickly and less accurately in test situations which measure inductive or logical reasoning, visual discrimination, reading, serial recall and concept formation (Zelniker and Jeffrey, 1976). External to a testing milieu, Epstein et al. (1975) report that reflective or impulsive attitudes are found in other individual behaviours. These include interview response style and motor reactions. Though the work in this area is limited, there is evidence suggesting that the generalization across various behaviours will remain as either reflective or impulsive.[8]

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[8]Becker et al. (1978) report longitudinal findings which contradict the persistency statement of impulsivity over time. It must be understood, however, that their experimentation was conducted with children whose mean age for the initial test was 87.2 months. This writer's introductory test data, as stated elsewhere in this text, plus the work of Kagan et al. (1964) suggest that children this young would experience difficulty in attaining a solution to the items initiated. On these grounds, Becker et al.'s (1978) critique, based on experimental results should be approached with caution.

The measure of conceptual tempo[9] (Kagan, 1966) involves two basic premises which may account for an impulsive or reflective manner. The first involves response uncertainty, in that for an accurate measurement of impulsivity-reflection to be obtained, there must be several response alternatives at the subject's disposal with which an apt stimulus comparison may be drawn. These must be presented to the child in a simultaneous manner to eliminate any bias of choice. If there are too few options (e.g. two) even the most reflective of children would react in an impulsive manner. The second assumption takes into account the conflict of responding quickly versus making a correct response. It is the relationship between a child's anxiety over error commission and his need for immediate success via a quick response that accounts to a great degree for his tendency to elicit reflective or impulsive behaviour.

(3) Modification of Impulsive Response Behaviour:

Given the previous discussion, it may be safely inferred that as an education objective, reflective behaviour is more desirable than impulsive behaviour. But equally obvious is the fact that not all students possess the reflective quality. The aim then becomes one of modification procedures designed to instil reflection in a problematic situation prior to its related response. The use of cognitive-behaviour analysis represents one such theoretical approach. The intent of cognitive-behavioural

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[9]The term "conceptual tempo" was initially coined by Jerome Kagan. It is synonymous with the study of reflective and impulsive behaviour in a variety of tests and settings. Specifically, it refers to a child's "mode of performance on tasks of high response uncertainty." (Egeland and Higgins, 1976, p. 213).

intervention is to lessen the rigid and external components of the behaviourist model while concomitantly adding structure and empiricism to the cognitive techniques. Its design attempts to utilize the proven efficiency of behaviour modification in a more flexible context. Inclusive is a cognitive awareness on behalf of the client regarding the need for therapeutic change (Kendall and Hollon, 1979).

The current status of the field of cognitive-behaviour therapy has been strongly influenced by Soviet psychology. The work of Luria (1961), Vygotsky (1962) and Luria and Yudovich (1968), via extensive research and laboratory testing has demonstrated the relationship that exists between speech and human behaviour. From the earliest months of a child's life, language is an influential force in his intellectual development. The transmission of concepts, knowledge and routines from parents to the child is predominantly accomplished through the medium of speech. As the infant develops comprehensible speech patterns, the egocentricity of speech (Piaget, 1959, 1973) takes on a specific function of assistance in solving a difficult problem. The verbal connections are used in mediation of the necessary behaviour (Luria and Yudovich, 1968). The nature of speech incorporated into the young child's active behaviour does not occur by accident. Initially, speech as such is coincidental with an activity, but as the child matures, speech will gradually precede the activity. What has taken place is the inherent shift from accompanying-speech to planning-speech (Luria, 1961). In doing so, speech is transformed to a means of expression, in attempt to release tension. This allows one's thought process

to seek and plan out the solution of a problem (Vygotsky, 1962). Although this self-directing speech is overt in early childhood, it will take on a covert nature at about five years of age. At this time, internal speech takes on a regulatory function of behaviour (Luria 1961). Adhering to the concept of the powerful use of speech in self-instructional techniques, cognitive-behaviour modification theorists have successfully attempted its use in a variety of treatment settings.[10] Counteraction of impulsivity represents one area in which specific related training procedures have been successful (Kagan, 1966; Kendall and Finch, 1979).

(4) Modification of Impulsive Learning Behaviour:

Related to the previous discussion of cognitive-behaviour modification, lies the verbal labelling and rehearsal procedures which a child may attempt to maximize his recall on serial ordered tasks. In a natural situation, a child will receive related feedback (either negative or positive) on the basis of his adequacy of recall for a task. It is generally the end result of a child's response that receives the majority of external reaction and attention. Seldom does this involve his appropriate use of a particular strategy to facilitate this recall leading to the resultant action (Galabert et al., 1976). This strategic implication requires realization in order to modify responses on the above stated tasks. Hagen and Kingsley (1968) have cited works which support the contention that memory

[10]The writer recognizes that within the confines of this study, a large number of settings in which this therapeutic measure has been successfully practiced will not be considered - see for example Turk and Genest (1979), Leon (1979) Pechakek and Danahar (1979), Mahoney (1979) and Meichenbaum (1979).

processes are influenced by appropriately applied verbal labels as they may be easily stored and are capable of conducting much information. Particularly with young children (as they are prone to lacking a variety of labels at their disposal) will the provision of verbal labels to a stimulus encourage memory recall. Children who have repeatedly shown to experience difficulty in the use of verbal labels do so as a result of either mediation deficiency (inability to properly use a verbal mediator) or production deficiency (failure to generate or contrive an appropriate verbal mediator). In either case, the developmental level of the child involved is accountable to his performance ability (Flavell, 1970). Although improved performance may be enhanced through labelling and rehearsal strategies, an age limit predominates. Six to ten year old children appear to significantly benefit from this strategy, but beyond that age, the external inducement of labels may result in significantly lower task performance (Hagen et al., 1970). Rationale for this developmental argument lies in the fact that older children, as a rule, possess a better developed information processing system, and the use of labels may be distracting and confuse the situation. There definitely appears to be a strong "serial position x verbal labelling x age" interaction effect. Verbal encoding, in turn, has proven to enhance recognition memory for visual information (Bacharach et al., 1976; Meyer, 1978).

(5) The Effect of Modification of Learning Behaviour on Response Behaviour:

Epstein et al. (1975) have determined that generalization of impulsivity will be present across varied behaviour conditions. This fact, plus the literature cited immediately above, allows

for the inference that appropriate use of a treatment strategy by the learners should transfer from a learning to a response behaviour condition. The verbal labelling and self-testing rehearsal strategies which have proven successful are appropriate with respect to the population studied in the present experiment (mean chronological age = 10.18 years). Kennedy and Miller (1976) have illustrated that if children are made aware of the cause and effect relationship of certain types of problem solving measures and verbal labelling and rehearsal techniques, they will adapt the continued use of these strategies in the absence of necessity to do so. This concept of strategic improvement of learning behaviour being generalized to response behaviour is of utmost importance in the present experiment. It maintains an assumption that according to the treatment techniques which were practiced, such a transfer would occur.

(B) MODIFICATION OF ANXIETY RELATED BEHAVIOUR BY THE LEARNER

(1) The Role of Reflective Abstraction:

Longitudinal studies to determine continued impulsive behaviour are scarce, but it appears that further complications lie in the observation that impulsivity may be persistent over time, though some reflectiveness will be attained through natural maturation (Epstein, 1975). A child of four years of age will react to a stimulus as a whole, whereas the nine year old will not only examine the whole closely, but also the internal aspects of the stimulus. Maturational capacity plus acquired habit have been noted as being accountable for this increased reflectiveness. Initially, concepts are seen as global labels for groups of similar entities, but later they become much more specific and

differentiated. This differential aspect of cognitive development is additionally complemented by its abstract capabilities, or as Kagan et al. (1963) have stated: "differentiation and abstraction proceed simultaneously" (p. 74). This enables the child to learn structured wholes, and characterizes reflective behaviour.

Piaget (1976) refers to the abstraction and reflection process as "reflective abstraction" (p. 45). It involves a self-examination of past behaviour and its subsequent modification, based on the experience provided by this examination. Fundamentally, two well defined traits of this reflective property predominate. Firstly, there exists a physical projection (from the previously established motor level to the conceptual level). Secondly, a reorganization occurs as a related perceptual inference has evolved from a sensorimotor action. This reorganization permits established links to govern similar circumstances in the future. The understanding developed involves both the "how" and "why" existence of a particular relationship. There are several intervals through which the child requires development to reach this level, however, which may even include rejection of obvious evidence. For example, the child may think what he has predicted will happen, even if shown otherwise, as he does not have a "feeling" for the contradiction.

The first step in the reaching of this "cognizance" involves the attainment of empirical abstraction (drawn from factual information of observable properties or co-ordinations themselves). This phenomenon tapers into reflective abstraction or inferences which may be drawn, based on these observable co-ordinations

(Piaget, 1976).

The quality of reflective abstraction is pertinent to the present study. The process commences with a common purpose (Piaget, 1976), the quest of a definite objective (problem solving). As Wagner (1982-b) has suggested, the learner is therefore seen as having a conscious awareness of two facets governing his response tendency: (a) its general nature, and (b) an accurate notion of the success or failure of his response. Although it is argued that a task may be performed with little conscious awareness, upon experiencing failure, the learner resorts to conscious attempts to analyze his/her behaviour in that context. Characteristic of this analysis is the examination of stimulus traits of the response alternatives and/or the task itself. This leads to consideration of the strategies previously employed which resulted in error. Through continual re-examination the learner may identify different stimulus features and modification attempts of the initial encoding scheme (Wagner, 1982-b). As such, a conceptualization of the underlying scheme of developing an accurate response strategy has occurred.

(2) The Relationship Between Reflective Abstraction And Rehearsal Strategy Learning

Kagan (1966) summarizes the mental process involved in tackling a problem as a chronological sequence requiring four phases plus a reporting phase:

> "Phase 1: Decoding of the problem; comprehension of the problem
> Phase 2: Selection of a likely hypothesis on which to act in order to arrive at solution
> Phase 3: Implementation of the hypothesis
> Phase 4: Evaluate the validity of the solution arrived at in Phase 3
> Phase 5: Report of the solution to an external agent." (Kagan, 1966, p. 17)

Relating these phases to the reflective-impulsive domain, it would appear that phase two (derivation of a vehicle for the solution) and phase four (evaluation of that solution or the preparation undertaken prior to reporting the solution) are most critical. Kagan et al. (1964) and Kagan (1966) conclude that the impulsive selection of a hypothetical solution (phase two) generally creates inaccurate performance. The role of evaluation (phase four) is paramount during the problem solving process, as the manner in which a child judges his hypothesis, will influence the quality of the encoding, memory, presentation of alternative hypotheses and finally the resultant cognitive product (Epstein et al., 1975). Kagan (1971) considers the derived hypothesis as "an interpretation of a discrepant event accomplished by mentally transforming the unusual event to a form a child is familiar with." (p. 68).

An individual will mentally relate novel information in terms and techniques with which he is most accustomed. Further to Kagan's definition, Epstein et al. (1975) contend that the evaluative process involves the individual's attention to stimuli, his interpretation of events and the generation of alternate hypotheses. Thus, throughout the evaluation period, the child is continually faced with feedback on previously accomplished problem solving activities.

Within the problem solving context, Wagner (1982-a) has considered a sequentially introduced four-step procedure:

(a) knowledge of success versus failure in performing the necessary task
(b) retrieval of appropriate strategies and attempt at determining the point of implementation in which the subject erred

(c) testing and monitoring his newly developed strategy
(d) repeated application of the new strategy to
  (i) self-reinforce
  (ii) develop a conscious awareness of the operational concept which is involved.

These four steps serve as a prelude to the attainment of reflective abstraction. An individual's use of rehearsal procedures as a strategy allows for a repeated focus on the original stimulus or problem intent, plus continued practice at evaluating his/her own solution. The reflective quality required to maintain an appropriate rehearsal strategy should in turn lead to improved performance in response and learning related tasks.

(3) The Role of Cognitive-Behaviour Modification Verbalization:

Immediate interest involves practical use of cognitive-behaviour modification in mediation of impulsive behaviour. Birch (1966) has hypothesized that behaviour as such will persist until an alternate tendency becomes stronger than the individual's original action. He found that an alternate tendency would be demonstrated by young children only when there was recognition on their behalf that a problem was present. Since an impulsive individual would generally lack sufficient problem solving skills (Little and Kendall, 1979) an approach, analogous to a task analysis is beneficial. A "think aloud" training programme with the self directed questions of: "(a) What is my problem?
(b) What is my plan?
(c) Am I using my plan?
(d) How did I do?
(Meichenbaum and Asarnow, 1979 p.14)

will assist in reducing impulsive, inappropriate responses and

actions (Kendall and Finch, 1979). Verbal self-control, if absent, is not so due to a developmental deficiency, but rather as a result of a learning deficit (Bem, 1967) implying that it can be taught at a later date. Cognitive-behaviour modification is not geared to determine "what" to think, but rather "how" to think. With practice, one may become more aware of his own capabilities via the attainment of metacognitive development. Meichenbaum and Asarnow (1979) aptly describe this as the "knowing about knowing" (p. 24) procedure. The self-communication in which one may engage in relation to task performance has led to research on the interesting and relevant concepts of metamemory, metaattention and metacommunication in learning situations. Self-directed routines such as "checking, planning, asking questions, self-testing, and monitoring ongoing attempts to solve problems" (Meichenbaum and Asarnow, 1979, p. 25) can then be realized as primary components of metacognitive development.

These procedures have been successful in modifying impulsive behaviour under selected conditions. Kagan (1966) attempted to induce reflectiveness in impulsive students via specific training procedures. The training consisted of direct instruction in reflection, enhanced by the formation of an identifiable relationship between the student and the experimenter. His findings supported the notion that appropriate modelling procedures by the experimenter (reflecting on a problem for a considerable length of time prior to responding) had a positive effect on the students in cases in which the student had a strong identity with the experimenter. This effect was decidedly

more significant in the measure of response delay than in the accuracy of performance. However, since the main objective was to encourage a slower response rate, and did not examine visual scanning strategies, this result was to be expected. The study itself did lend credence to the fact that impulsive children can be taught to modify their behaviour and that the modified behaviour will remain in effect (Kagan, 1966).

(4) The Relationship Between Cognitive-Behaviour Modification and Rehearsal Strategy Learning:

A central theme evolves from the finding of the experiments which deal with the use of verbal self-instructions or imitation to modify one's behaviour. It appears that a subject's effectiveness at these skills is heightened if he/she is taught how to organize and orient his/her responses (Wright and Kagan, 1973). This involves the knowledge of examining the proper cues and use of feedback from external and internal reactions. Planning behaviour in advance, as such, requires the ability to reason through and think about an activity, and the subsequent image construction of it. Learning strategies which incorporate rehearsal procedures are closely tied to the cognitive-behavioural approach through the self-verbalization medium (either overt or covert). If properly attempted, one is afforded the obvious familiarity of repeated practice of the related strategy with the added benefit of modification of resultant behaviour. The nature of one's response and a higher motivation level, which Kagan (1964) has noted as being a determinant of impulsive behaviour, can be positively affected through self-instructional rehearsal techniques.

Alley and Deschler (1979) have defined a learning strategy

as consisting of:

> "techniques, principles or rules that will facilitate the acquisition, manipulation, integration, storage and retrieval of information across situations and settings." (p. 13)

As a model of instruction, a learning strategy focuses on the "how" to learn rather than the teaching of specific content. Its intent is to facilitate the acquisition of information in separate but related academic areas (Alley and Deshler, 1979). Within the context of problem solving, complex cognitive operations such as "discrimination, memory, integration, concept formation and language" (Alley and Deshler, 1979, p. 220) are required. High anxious students, as with learning disabled children, invariably evidence a breakdown somewhere in the process (Alley and Deshler, 1979). With those subjects, Bauer (1977) has determined that active rehearsal is necessary for short term retention of verbal information. However, the rehearsal procedures of learning disabled children are generally inferior to those of normal students (Bauer, 1977). Given the link between anxious states and learning disabled students, the choice of rehearsal techniques as a strategy may be employed to assist learning behaviour of subjects within the present experiment. It is reasonable to assume that a difference of spontaneous rehearsal time will be shown between the high anxious and low anxious group and that it may be a function of anxiety induced avoidance behaviour.

Rehearsal itself has been operationally defined as stimulus repetition (Randus and Atkinson, 1970). In their work with adults, Randus and Atkinson (1970) found a positive correlation

between overt rehearsal procedures and free recall. Other studies have shown that higher I.Q. children produced greater rehearsal and recall than their lower counterparts (Fagen, 1972), and that adults and older children use more active and effective rehearsal procedures to improve recall than young children (Cuvo, 1975). In addition, Gagné (1962) discovered that verbal principles, if they are to be effective, must be repeated overtly or covertly by the subject. The act of rehearsal seems to encourage subjects to make additional effort in a problem solving task, resulting in superior performance. In essence, verbal rehearsal "forces the subjects to think" (Gagné, 1962, p. 17).

Cuvo (1975) has designated two types of rehearsal which are instrumental in recalling information from defined rehearsal sets. Type I (maintenance rehearsal) requires continual item repetition in order to be processed. If it is not constantly attended to, its trace will decay, becoming non retrievable. Type II (elaborative rehearsal) involves a deeper analysis of the stimulus, including cognitive or semantic elaboration and enrichment (Cuvo, 1975). It is the latter rehearsal type that is inclusive in the present study, as the training employed involves semantic (labelling) plus elaborative (overt verbalization, covering the stimulus plus looking away or repeating by memory) techniques. This, in turn, makes easier the retrieval of information when required.

Children who demonstrate a production deficiency in the use of a mnemonic strategy during the input stage may be strategically trained to enhance their recall capacity (Ringel and Springer, 1980). However, young children (Ringel and Springer, 1980) and learning disabled children (Bauer, 1977) have

demonstrated a lack of transfer of this strategy use. This may occur because those students do not typically or spontaneously evaluate their own memory performance. Children as such are more likely not to engage in self-monitoring behaviour and therefore are potentially unaware of the derived benefits of doing so. Their higher failure rate of transfer experienced, may be accounted for by a lack of awareness that improvement in recall performance is due to the use of an effective mnemonic strategy (Ringel and Springer, 1980). Even following specific training, a learning disabled child may not employ an effective learning strategy (Alley and Deshler, 1979). In view of the present study, it is presumable that high anxious students in particular, if merely told to rehearse, would allow an insufficient amount of rehearsal time to the learning tasks. However, this experimenter not only introduced a particular rehearsal strategy, but also suggested specific procedures which, if subsequently adopted, would probably improve performance of the subjects. Through verbal labelling and the intended design of self-evaluation (via cognitive-behavioural modification) an established link between the self-verbalization and rehearsal strategy learning is proposed. If appropriately used, the subjects should be afforded a knowledge of the relationship between memory means and goals, which is a crucial determinant of performance (Ringel and Springer, 1980).

If an individual's behaviour is not conducive to accurate response and learning performance, he is apt to receive repeated failures (Combs et al., 1976). Effective institution of cognitive-behaviour modification procedures may facilitate the development of strategic learning techniques. Wilson et al. (1975)

discovered that incentives are influential in determining memory recall. The actual flow of information into and out of the buffers is modified by the differential incentive value attached to the information. A strategy which has personal significance to the subject will motivate his attention to the selection of relevant cues. This in turn tends to promote selective learning and organization in recall and recognition (Wilson et al., 1975). As the subject becomes more adept in the use of the rehearsal strategies[11], it may be expected that his/her eventual performance in memory related tasks will also be improved (Hagen and Kingsley, 1968). The success of a training programme may be evaluated according to (a) its maintenance over time, and (b) its generalization to new material (Randall et al., 1980). The latter component of generalization or:

> "a test of transfer to a situation similar in many ways but different in at least one respect" (Engel et al., 1980, p. 439).

was expected in the present experiment. The semantic strategy's enhancement of recall in both the learning and response condition for the two subject groups, determined its value as a mnemonic aid and transfer agent (Engel et al., 1980).

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[11] Again it is to be noted that this adeptness will evolve more readily if the rehearsal strategies are developed in a manner which is personally identifiable to the individual involved (Combs et al., 1976). For example, if verbal labels are employed within a rehearsal strategy to promote learning behaviour, it may be expected that a naming procedure devised by the subject will tend to promote a higher success rate than if these labels are externally applied. Rationale for this argument is based on the fact that the external application may not actually be compatible to the subject's perception of an entity.

(5) Transfer of the Imposed Training Procedures (Reflective Abstraction and Cognitive Behaviour Modification) Within Learning Behaviour to Response Behaviour

A succinct summary of the entire problem solving mechanism has been considered by Kagan (1964) as encompassing three stages:

> "(a) initial categorization of encoded material
> (b) storage of encoded material
> (c) the imposing of transformational or mediational elaboration upon the material" (p. 1)

Very simply, an individual will initially categorize and store (in either his/her long or short term memory) newly encoded material. This involves an alteration in such a way that it may be adapted to its most familiar form to facilitate retrieval.

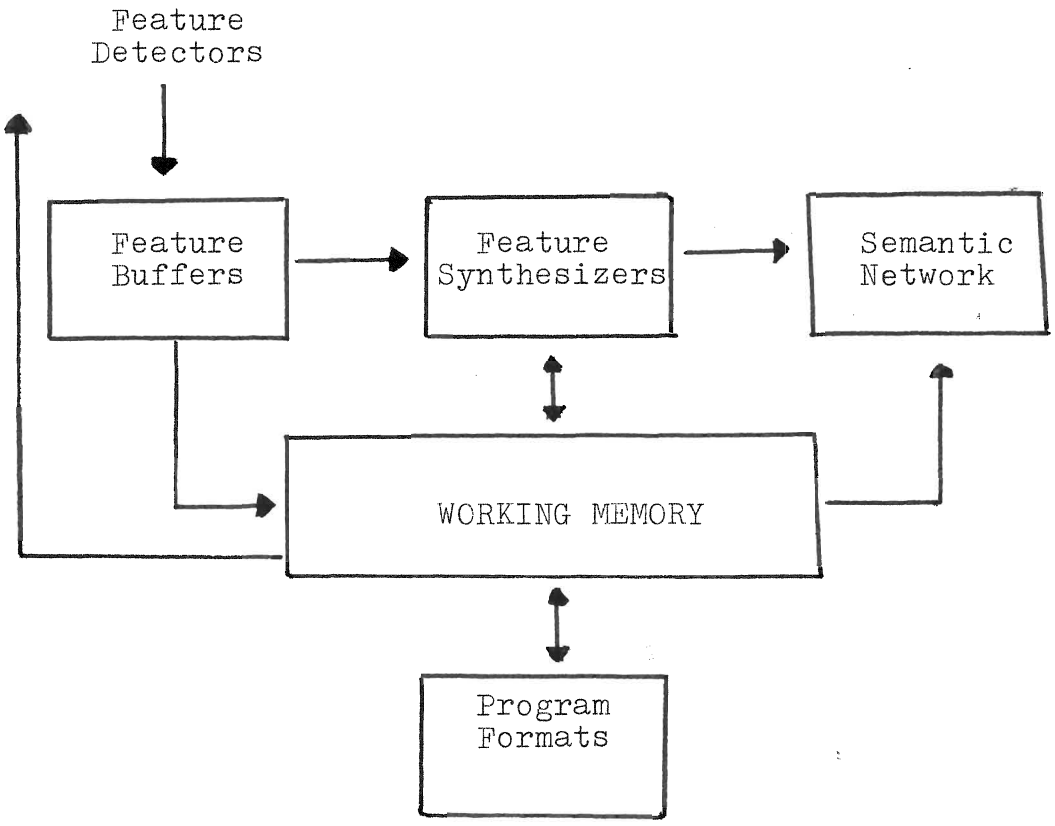
Subsequently, the idea of "meaning" of the information perceived is introduced. This semantic inference may best be thought of as a network of concepts. Its role is to provide readily available assistance, based on previous associations, to the detecting, buffering and synthesizing processes which have initially occurred. Information (as in a test item) with which an association may be made can be readily stored and easily retrieved (Kagan et al., 1964).

Examination of a mental task involves the establishment of well defined programmes with related goals. Incoming features of the information are retained by the semantic network in one's working memory. The programme, in that state, can thus be monitored through a variety of individually acquired formats, based on previously employed strategies. This internal checking and rechecking process may then allow for strategic generalization

to similar circumstances. Review of the human information processing model presented earlier in this chapter, supplemented by the introduction of a semantic network may be presented more clearly in diagramatic form (see Figure 2-1).

Figure 2-1

A SCHEMATIC FLOW CHART OF THE HUMAN INFORMATION-PROCESSING SYSTEM



from Farnham-Diggory, 1978, p. 89

The previous description is relevant to the present study. Consider, for example, the picture of a teddy bear sitting on a chair, which is given as one of Kagan's (1966) items on the

Matching Familiar Figures Test.[12] A child, who is asked to select the identical item (from the group of six) to the original stimulus, will undertake the programme procedures listed above. Initially, isolated features of the stimulus will be detected (i.e. the distinct feature of the chair and teddy bear). As this feature analysis is undertaken through the feature buffers, the subject may discriminate among the six alternate responses via a feature matching comparison. The provision of the initial stimulus serves a two-fold purpose: (a) its presence allows for readily available cued comparisons (b) its familiarity as an object will enhance the semantic network, allowing recall of features which are necessary in this task to be accomplished. As information is accumulated, it becomes integrated into the individual's working memory (Zelniker and Jeffrey, 1976).

The strategies utilized by an impulsive child in processing stimuli and in selection of ideas and thoughts are holistic in nature, with only limited feature analysis. Conversely, the feature analysis of a reflective child are more analytically complete (Janis et al., 1969; Egeland and Higgins, 1976). For each mental process involved in a stimulus-match display, a subject may undertake exhaustive scanning techniques or employ self-terminating scanning procedures (Sternberg and Rifkin, 1979). In the case of the former, comparisons are made among all attribute values for a given stimulus (which may not include all

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[12] Kagan's (1966) instrument was used within this experiment as a measure of a child's impulsive-reflective response tendency. The instrument itself will be explained in detail in Chapter III of the present paper. Suffice it at this point to consider the above mentioned item as a stimulus and the six associated pictures, of which only one is identical, as the alternate responses. (Refer to Appendix I of this paper).

possible attributes, as they may not have all been initially encoded). Self-terminating scanning, on the other hand, involves only a portion of possible comparisons (Sternberg and Rifkin, 1979). Exhaustive scanning has proven to be a more sophisticated and efficient form of memory scanning (Sternberg and Rifkin, 1979), as it readily leads to a systematic elimination of irrelevant features (Zelniker and Jeffrey, 1976). Re-employing the example from Kagan's MFF test cited earlier (the teddy bear on a chair), consider a subject attempting to match to stimulus problem. Exhaustive scanning would compare each response alternative to the stimulus in determining a set of matched features or mismatched features. Upon discovery of the differentiating feature, that particular response alternative would be eliminated. Through the process of elimination the appropriate choice may be arrived at. Self-terminating scanning, however, involves comparison of one or very few matched features (to the original stimulus) and selection of the response alternative on that basis, very often without consideration of the remaining choice. The probability of error through use of this latter comparative technique is greatly increased. The more analytical approach of exhaustive scanning techniques, generally resulting in more accurate performance, is characteristic of reflective children (Janis et al., 1969).

This leads to the present discussion on transfer of strategic learned behaviour to a response condition. Kagan et al.'s (1964) three stage matrix of problem solving and Farnham-Diggory's (1978) information processing model, both previously presented, have similar views, but are expressed somewhat differently.

In tabular form, their two theorems may be unified as follows:

Table 2-1

KAGAN AND FARNHAM-DIGGORY - INFORMATION PROCESSING

	Kagan	Farnham-Diggory
I	Encoding	Feature Detection
II	Storage of Encoded Information	Feature Buffers Feature Synthesizers Semantic Network Working Memory
III	Elaboration of Encoded Material	Program Format

Kagan's efforts offer assistance in appropriately delineating the stages, while Farnham-Diggory's explanation neatly summarizes their function.

For both children and adults, the stimulus characteristics in a stimulus-response problem solving task are important determinants of speed and accuracy of classification decisions (Kagan et al., 1964). The use of an abstract stimulus would create a more difficult operation, as the ability to compare like features of a nonsensical item would prove to be more time consuming and perhaps error provoking, when trying to formulate an appropriate response (Zelniker and Jeffrey, 1976).[13] This generates a discussion on separable and integral attributes of

[13] It is worthy of note that the testing of response behaviour in the present study utilizes a match to sample of familiar figures (MFF) while the evaluation of learning behaviour is based on the subjects' recall of predominantly abstract designs (plastic tiles of the visual sequential memory test of the I.T.P.A.).

a given stimulus. As Sternberg and Rifkin (1979) have stated, in analogical reasoning, a stimulus with separable attributes is one in which various features may be removed without destroying the intactness of the primary figure itself. On the response measure of Kagan's (1964) MFF test (e.g. the teddy bear on the chair) removal of selected features (e.g. the bow, or a leg of the chair) would not alter the focus of attention (the teddy bear itself). A stimulus composed of integral attributes, conversely, requires that all features remain intact in order for a subject not to experience difficulty in mentally processing the stimulus. This classification would more suitably be applied to the figural tiles used in testing learning behaviour (see appendix II). Elimination of an attribute of a stimulus with separable attributes will not significantly affect the preservation of the stimulus itself. Nullifying an attribute of a stimulus with integral attributes alters significantly the characteristic design of the stimulus. Similarly, there is a wealth of literature, as quoted by Sternberg and Rifkin (1979) which

> "....indicates that integral and separable attributes are subjected to different psychological mechanisms" (p. 199)

From this inference, it would appear that the cognitive processes involved in the learning behaviour component and the response behaviour component of the present experiment are not identical. The uniqueness (to the researcher's knowledge) of this experiment will examine the transfer which occurs in development of strategic learning behaviour to a response condition.

A procedure is a "non optional, non conscious model of information processing" (Sternberg and Rifkin, 1979, p. 199)

whereas a strategy is an "optional, conscious model of information processing" (Sternberg and Rifkin, 1979, p. 199). In the case of the latter the subject is totally aware of what is occurring, at a conscious level, which is not always so in the former. It would be erroneous, however, for one to perceive cognitive development as merely:

> "(a) what procedure or strategy is executed, or
> (b) how well the chosen strategy is executed"
> (Sternberg and Rifkin, 1979, p. 228).

The extent to which a strategy or procedure is applied at all, or Flavell's (1970) "development of planfulness" must also be taken into account. Within this experiment, the formation of a strategy (the appropriate use of verbal labelling and rehearsal as discussed earlier in this chapter) which would improve an individual's learning behaviour would not necessary apply to response behaviour. The direct rehearsal and self-testing strategy of subjects in the learning condition maintains an inherent slower and more analytic verbal mediation. The complete item feature analysis and matching to the stimulus required for reflective response behaviour is characteristic of a similar indirect slower and analytic behaviour. A transfer of direct strategy use for the two separate measures is not expected. It is the manner of instituting a strategy and the related indirect reflective quality as evidenced by the learning condition that is expected to generalize the subjects' response behaviour.

(6) Summary:

Information processing strategies (examination of detail which may be approached differently by impulsive and reflective children) and subsequent modification studies (the training of

impulsives to respond more slowly and accurately) have been studied at length. This constitutes the "how" impulsive and reflective children differ and the treatment procedures which have been attempted to counteract impulsivity. Relative to these concepts, however, there is a paucity of research which delves into the "why" these noted differences exist. This study represents one attempt to satisfy this need through the three dimensional paradigm of

- anxiety
- learning/response behaviour transference
- impulsive/reflective tendencies

regarding intellectual problem solving activities of young children. The works cited in the introductory chapter and the subsequent literature review do lend credence to the attainment of the initial and associated hypotheses. With a general knowledge of the basic concepts presented, a detailed analysis of the present experiment may be undertaken.

CHAPTER III - EXPERIMENTAL DESIGN

This chapter will be devoted to a hypothesis statement and the instrumentation and experimental procedures which were employed by this researcher.

(A) HYPOTHESES

The derived initial hypothesis of the present experiment has been stated as:

> (1) A general measure of anxiety (as per the C.A.S.) will be related to the degree of impulsive response and learning behaviour of children, in that high anxious subjects should be more impulsive than low anxious children.

The dependent variable consists of a measure of response behaviour and resultant modification procedures as evidenced through the use of Kagan's (1966) Matching Familiar Figures test, and the study of Learning Strategies (attained through the use of the Illinois Test of Psycholinguistic Abilities - Visual Sequential Memory Test). The independent variable consists of an anxiety measure which is given by the Child Anxiety Scale (Gillis, 1978). Scoring procedures will be participant of two sample groups (a) the low anxious sample, and (b) the high anxious sample.

Within the original dependent variable, two associated hypotheses will be proposed, which will examine the relationship between strategic learning behaviour and response behaviour. An

examination of the transfer or generalization of proposed learning strategies in a training condition to response mechanisms in problem solving situations of both high and low anxious groups will be attempted. It is expected that:

(2) High anxious children will be able to acquire reflective learning behaviour, and the related strategies should transfer to their problem solving behaviour.

(3) A control group of low anxious subjects will evidence lower levels of impulsive behaviour and will correspondingly produce less improvement and transfer as a result.

(B) THE DEPENDENT VARIABLE

Within this experiment, the original dependent variable consists of two basic components:

- response time and accuracy
- rehearsal time and learning strategies/recall accuracy

(1) Response Behaviour (Introductory Testing):

The measure of response behaviour has been derived via Kagan's (1966) Matching Familiar Figure's Test. This study's use of that instrument will be subsequently considered, but initial mention should be made of its appropriateness. Introductory testing procedures involved a random selection of twelve students (aged eight and nine years), from the same geographical drawing area in which the experiment was conducted. The intent was to determine an appropriate age/grade level based on two measures: (a) response latency (the measured time lapse between the presentation of the stimulus to the subject and his response), and (b) response accuracy (the correct or incorrect nature of the subject's first attempt).

All testing procedures were individually administered with the following instructions intact (E below refers to experimenter, S refers to subject).

Modification Strategies of Responses (MFF)

Administration of Trials 1-6:

E. - "I am going to show you a series of pictures that you will be familiar with. For each picture I show you, there will be six choices of other figures which will look similar. Only one of these choices will be identical. I want you to point to the one that is exactly the same as the first picture I show you. O.K. now we will do two for practice."

(E. introduces first two trials - they are not scored)

E. - "Now, we will do the same for the rest of these pictures. Are there any questions?"

Proceed

Verbal Protocol:

After the child has selected an answer, E says -

(a) "Very good, that was the correct choice. What things in the picture told you that it was the right answer?"

or

(b) "That was a good try, but not quite the right answer. What was it in that picture that made you select that response?"

Go to next question.

Through comparison of means (response latency and response accuracy) of the first three trials and the next three trials, one can establish whether or not cognitive modification strategies have begun to be established. If such strategies have been undertaken by the subjects, it would be expected that their response time would be increased and their response accuracy improved.

Trials 7-12:

At the onset of trial 7, training is introduced:

E. - "Now I want to try something a little different. I want you to tell me all of the things that are the same in the picture you choose as those in the original picture."

S. - Responds.

E. - (a) "Very good, that was the correct answer. Why didn't you choose this one?" - (work through other alternatives).

or

(b) "That was a good choice but not quite the right answer. Why didn't you choose this one?" (Work through other alternatives, saving the correct response for last. See if the child is able to distinguish the correct response from the one which he has initially selected).

Introductory Testing Results are Outlined Below:

Response Latency: Let the reader compare the mean of the first three trials to the mean of the next three trials (figure 3-1 I). Since all trials are assumed to require an equal amount of problem solving ability, an increase in the latter mean would demonstrate that the subject being tested is increasing his response time. Following training procedures by the experimenter, it would be expected that the response latency would be further increased. This did in fact occur at a significant level ($p < .05$). Both increases noted indicate that within this sample, the subjects refined their search strategies somewhat on their own, and following training, increased their reflectiveness to a greater degree. A comparison of the resultant means are listed below:

	Response Latency	
	Trials	Mean
(1)	1-3	14.80 secs.
(2)	4-6	16.84 secs.
(3)	7-12	26.59 secs.

A correlation of subjects and increased response time indicated that nine subjects changed in a positive direction and three in a negative direction (from (1) → (2)). Following training

Figure 3-1 (I) Initial Testing - MFF Test

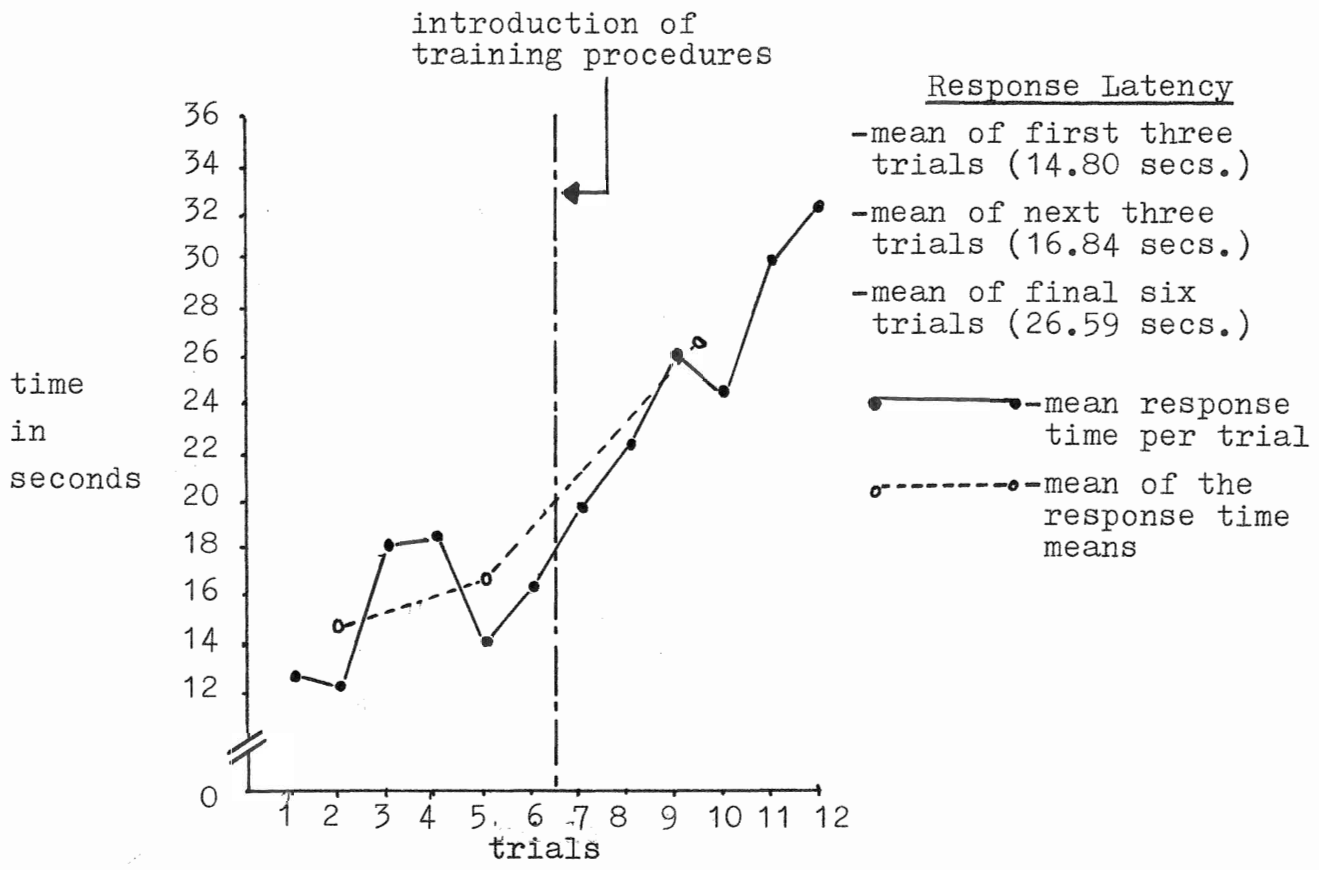
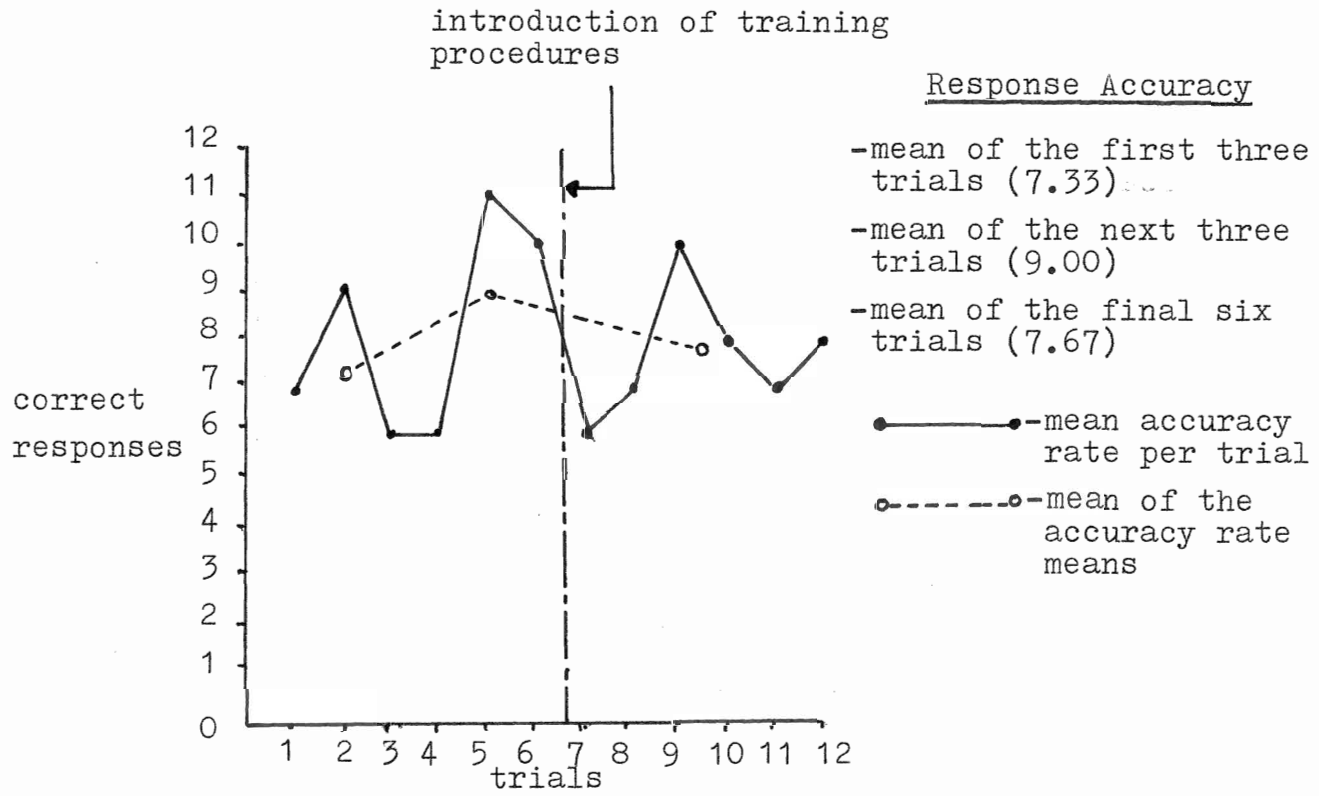


Figure 3-1 (II) Initial Testing - MFF Test



procedures (from (2)→(3)), response time increased in eleven cases, decreased in none and remained virtually unchanged in one case. There was a slight improvement between the first two blocks of trials, but this improvement was not statistically significant. Therefore it may be concluded that over the six trials of practice, the subjects were not making the kind of improvement necessary, on their own. However, following the treatment procedures (immediately after trial six), a significant difference in performance was noted. (These results permitted the experimenter to assume that a pretest/treatment/posttest design was a suitable approach to the study.)

Response Accuracy: Results of the experimentation regarding accuracy of response were not nearly as convincing. Derived means (on a similar basis as per latency), showed more accurate responses in trials 4-6 when compared to trials 1-3, but declined in trials 7-12 following the training procedures (Figure 3-1 II).

Response Accuracy

(1) mean of trials 1-3 - 7.30
(2) mean of trials 4-6 - 9.00
(3) mean of trials 7-12 - 7.67

This nonsignificant finding might be the result of two factors; (a) the sample size (N=12) was quite small, and (b) the difficulty of the task for these subjects. The task employed proved quite difficult for the younger children, and although these children may have been acquiring a more reflective response strategy they may not have been able to attain any degree of accuracy.

The experimental design to be implemented in actual testing for the thesis should satisfy these limitations as a larger sample will be studied and a more homogeneous group (grade 4 students only) will be attempted. Properly conducted experimentation should determine (a) if and how the high and low anxious groups differ with respect to the original dependent variable, and (b) the transfer that takes place from strategic learning behaviour

to response behaviour.

(2) Learning Behaviour

The development of strategic forms of learning behaviour is fundamental to the nature of responses which a student will make. It has been argued previously that responses can be modified in that subjects may be trained to respond more slowly (increased reflection) and more accurately through specific remediation techniques. Modification techniques as such, generally refer to direct self-instructional procedures designed to alter response behaviour.

The present experiment differs from this maxim in that the training procedures introduced were in relation to item selection and item sequencing (the Visual Sequential Memory Test of the I.T.P.A. - see footnote #17. This represents the learning condition of the experiment. The actual strategy itself (verbal labelling plus rehearsal) is not expected to transfer to the response condition (Kagan's MFF Posttest measure). This response measure requires visual scanning comparative techniques, whereas the learning condition involves selection plus sequencing of the stimulus components. It is, however, hypothesized that high anxious children will be able to acquire reflective learning behaviour and it is the reflective quality of these related strategies and not the identical strategy listed above that will transfer to their problem solving behaviour. The actual techniques employed will be described within the experimental procedures immediately following.

(C) EXPERIMENTAL PROCEDURES:

(1) Measurement of the Independent Variable:

Fifty-three grade four students from two suburban schools,

under the jurisdiction of the Lincoln County Board of Education were selected as participants in this experiment.[14] Upon attainment of parental and school board approval,[15] these students were administered the Child Anxiety Scale.[16] Administration procedures consisted of small group presentation (the average size being 8.8 subjects), in a private room of the respective schools. The experimenter initially explained the instructions with visual blackboard graphics of proper methods of marking the self-report questionnaire. Subsequently, a tape cassette, included with the C.A.S. manual, was played which contained the twenty questions and allowable response time. Through its use, any bias on the part of the instructor with respect to voice emphasis and fluctuations, and unequal response times was eliminated.

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[14] For reasons of confidentiality, further specific information regarding students and schools involved cannot be divulged.

[15] Appendix III of this text includes the request and consent forms issued to parents and the school board of subjects involved in this experiment.

[16] The Child Anxiety Scale was selected because of its credibility with respect to reliability and validity. As a check on its consistency, (a reliability measure) in a test-retest setting with 127 young children, the following Pearson Product Moment Reliability Coefficients were found:

Grade 1 - .82
Grade 2 - .88
Grade 3 - .92 (Gillis, 1980, p. 21)

Examination of the internal consistency of the C.A.S. in a sample of 343 children produced a Kuder-Richardson 20 coefficient of .73. As a statement on its validity, the items were selected on the basis of how well they correlate with a pure anxiety factor which was previously established from specified primary personality traits. In two sample tests, conguence figures were found to be .81 ($p < .01$) for the first sample and .74 ($p < .05$) for the second sample. This suggests that the C.A.S. is essentially true to the intent of its measure (such as emotional instability, shyness, excitability, tension) and has a proven correlation between the test items and pure anxiety factor (Gillis, 1980). The instrument's consistency in test-retest conditions indicates its comprehensibility and applicability at various elementary grade levels. In addition, the self-report questionnaire is straight forward in administration and scoring, as well as being enjoyable to the students taking part. The questionnaire itself is included in Appendix IV.

Scoring on the Child Anxiety Scale was conducted in the manner explained in the manual. By way of conversion tables which were provided, raw scores were converted to either percentile scores or sten scores. As it has been found that scores differ with respect to grade levels, the table which is pertinent to this study, i.e. grade four students, is included for the reader's perusal. As per the C.A.S. manual, sten scores of 8, 9, or 10 reflect significant departures from the norm in terms of elevated anxiety. Scores of 1, 2, or 3 offer equally significant departures in the opposite direction, while scores of 4 through 7 typically define the average range of the trait (Gillis, 1980). Within this study, raw scores of 11 (sten score - upper 6) and greater represented the high anxious group, while raw scores of

- See Table 3-1 -

less than 6 (sten score - 4) represented the low anxious group. None of the returned questionnaires were declared invalid. Respective group sizes were twelve subjects for the former group and sixteen subjects for the latter. The remaining twenty-five subjects tested were in the norm range from raw score 7 (sten score - 5) to raw score 10 inclusive (sten score - lower 6). This comprised 47.17% of the entire population which meant that 52.83% had scores reflective of the high anxious or low anxious nature. Of these, 42.85% were considered high anxious and 57.15% were considered low anxious subjects. Figure 3-2 visually compares the standard according to the C.A.S. manual with findings of the researcher.

As alluded to earlier, the subject group was homogeneous with respect to grade level (all were grade four students).

Table 3-1

GRADE 4 NORMS

FOR CONVERTING RAW SCORES TO STENS OR PERCENTILES

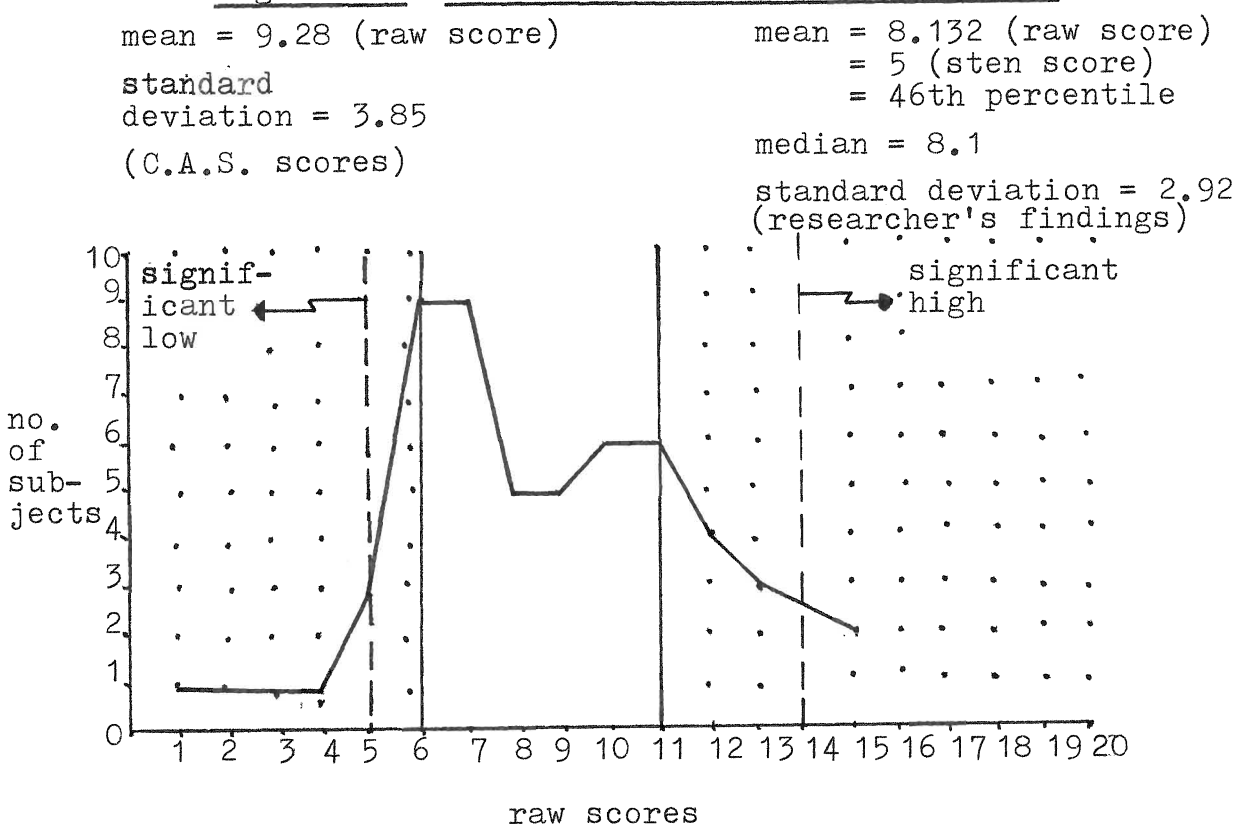
Raw Score	Sten	Percentile	Raw Score
0	1	1	0
1	1	2	1
2	2	3	2
3	2	6	3
4	3	9	4
5	3	17	5
6	4	25	6
7	5	34	7
8	5	44	8
9	5	54	9
10	6	64	10
11	6	71	11
12	7	79	12
13	7	86	13
14	8	92	14
15	8	94	15
16	9	96	16
17	9	97	17
18	10	99	18
19	10	99	19
20	10	99	20

Based on 406 cases; 222 boys and 184 girls

-from Gillis, 1980, p.16.

The age range of the entire population was from 9 years 5½ months to 11 years 6 months with the mean age being 10.18 years (10 years 2¼ months).

Figure 3-2 C.A.S. and Present Testing Norms



(2) Measurement of the Dependent Variable

The first dependent variable of this experiment involved the response tendencies of both the low and the high anxious groups in a pretest and posttest measure (Kagan's MFF test). In addition, strategic training of learning behaviour was attempted following the pretest and prior to the posttest. This was accomplished through the variation and arrangement of tiles included in the Visual Sequential Memory test of the Illinois Test of Psycholinguistic Abilities.[17] Through comparison of the

[17]Appendix II of this text includes a reproduction of the plastic tiles used in the visual sequential memory test.

pre and posttest scores of the MFF test, the effect of strategic learning behaviour on response behaviour could be measured in both the high anxious and low anxious groups (the associated independent variable).

(3) Procedures for Measurement of the Dependent Variable:

Individual testing was conducted in a private area in the following manner:

Pretest Response Behaviour:

> The subject was told that he/she would be shown a series of pictures of things that were recognizable. He/she was told that with each picture there would be six choices of which only one was identical. His/her job was to pick out the one of these choices that was exactly the same as the picture being shown. (The experimenter sat at right angles to the subject holding the stimulus picture in a vertical position. The alternatives were horizontal on the table in front of the subject). The subject then pointed to the response alternative which he/she felt was exactly the same. Two trials were then conducted as practice to make certain that the subject had understood the instructions. The items used in the pretest included (1) house (3) telephone (5) tree (7) cat (9) giraffe (11) boat. Odd numbers of figures were chosen to eliminate any bias of rank order of difficulty which may exist. The two methods of evaluating responses by the subjects were (i) response time (the time taken from when the subject was shown the stimulus picture to the point of his/her selection. This was kept on a stopwatch by the experimenter). (ii) response accuracy (a correct or incorrect selection of the response alternatives).

Strategic Learning Behaviour:

> Upon completion of the pretest measure of Kagan's MFF test, subjects were instructed that they would then be shown some plastic tiles with designs on them that were not quite as easy to recognize. The experimenter then spread the tiles on the table in front of the subject. Two tiles were randomly selected by the experimenter and placed on a rubber pad in front of the subject. The experimenter said to the subject, "Now, I want you to look at the two tiles immediately in

front of you. When you think you know which two they are and in what order they are in, I want you to tell me. Then I am going to mix them in with the other tiles and have you choose which two were on the pad and in what order they were placed." One trial was done to assure that the subject understood the instructions. Following this, the number of tiles placed on the rubber pad for examination was singularly increased until the subject erred in either his/her response item or order selection. At this point his baseline was established (determined by the number of tiles which he has successfully recalled - e.g. if an error occurred when the subject was confronted with five tiles, then his baseline would be level four, as that was his highest successful attempt). Following the establishment of a baseline, the experimenter interjects, "It may be easier to remember which tiles were there and in what order if you can name them. Now, what do you think this tile looks like?" (Experimenter points to one of the tiles on the pad - subject responds). "And this one?" (Experimenter designates a different tile), etc. After the subject has gained some familiarity with this labelling procedure, the subject is instructed in a means of verbal rehearsal which may facilitate the appropriate selection of tiles. In demonstration, the experimenter covers the tiles and looks away, finger counts and suggests that perhaps even saying their order aloud may assist in solution of this problem. Working from the baseline, three trials at each successive level are attempted. The subject advances to the highest level possible until he/she errs on two of three, or three of three trials at a given level. At this point the learning behaviour testing would cease. The degree in which the subject employs the strategies (covert or overt) is entirely their choice. Rehearsal time taken and recall accuracy are measured with respect to the correct placement of tiles.

Posttest Response Behaviour:

Exactly the same procedure is followed in the posttest measurement as in the pretest measurement of responses. The items used in the posttest include Kagan's (2) scissors (4) teddy bear on a chair (6) leaf (8) dress (10) lamp (12) cowboy. Similarly, response time and accuracy are the variables measured.

Analysis of the data collected (both independent and dependent measures) is explained in Chapter IV.

CHAPTER IV
ANALYSIS OF RESULTS

The independent variable in this study (the low anxious/high anxious delineation) has been presented in Chapter III. Twelve subjects were found to comprise the high anxious group, while sixteen subjects scored in the low anxious sector. To complement the anxiety measures, this researcher polled the appropriate teachers requesting the designation of ten students who they perceive to be most anxious in their classroom. These teachers had unknowingly denoted nine of the twelve subjects who were identified as being high anxious by the Child Anxiety Scale.

Researchers have discovered that properly conducted experiments, undertaking the examination of gain scores, as in a pretest/treatment/posttest condition, constitutes a highly reliable measure (Zimmerman and Williams, 1982). Not only in the physical sciences, but also the behavioural sciences, where error may be substantial, this reliability is consistent. Within the vein of gain score differential, results of the present experiment may be examined.

(A) DID THE HIGH ANXIOUS SUBJECTS BENEFIT MORE FROM REHEARSAL TRAINING THAN THE LOW ANXIOUS SUBJECTS?

This first analysis of variance examines the effect of the training procedures on the performance of high anxious and low anxious subjects. This was arrived at through comparison of the

baseline establishment and the maximum level successfully completed in the learning condition only. Measures of rehearsal time and recall accuracy are considered. The rehearsal time measure compares the latency at the baseline and the maximum level; while the recall accuracy figure is derived from the increase in levels attained from the baseline to the maximum level. A 2 factor (baseline - maximum level) x 2 factor (high anxious/low anxious) ANOVA was conducted with respect to rehearsal time and recall accuracy. This is a two way analysis for one between Subject Factor - A and one within Subject Factor B. Table 4-1 following lists the results.

Subject Factor A = High Anxious/Low Anxious
Subject Factor B = Baseline/Maximum Level
where A_1 = High Anxious
A_2 = Low Anxious
B_1 = Baseline
B_2 = Maximum Level

- see Table 4-1 -

Clearly, the change which took place in the subjects' performance following the treatment procedures was significant within the groups (rehearsal time $p < .005$, recall accuracy $p < .005$) however not between the groups nor in the interaction of the groups. This refers strictly to the changes which occurred during the training procedures (the Visual Sequential Memory Test of the I.T.P.A.). Since there is not a significant difference between the low anxious versus high anxious subjects' performance (designated as "Between Subjects" on Table 4-1) one can assume that the general anxiety level of the students involved (as per the Child Anxiety Scale) is not a significant factor in differentiating the learning behaviour of these children with respect to rehearsal time and recall accuracy. The training

Table 4-1

TWO WAY ANALYSIS OF VARIANCE
(HIGH ANXIOUS/LOW ANXIOUS - BASELINE/MAXIMUM LEVEL)
WITH RESPECT TO LEARNING BEHAVIOUR

		Means	Mean Square	Degrees of Freedom		F	P
Rehearsal Time	A_1, A_2	32.81 30.21	80.94	1 22	Between Subjects	.045	n.s.
	B_1, B_2	21.75 41.28	4576.07	1 22	Within Subjects	10.25	.005
	A_1B_1, A_1B_2	20.13 45.50	410.26	1 22	A * B	.919	n.s.
	A_2B_1, A_2B_2	23.38 37.06					
Recall Accuracy	A_1, A_2	3.75 3.96	.5208	1 22	Between Subjects	.2164	n.s.
	B_1, B_2	3.29 4.42	15.18	1 22	Within Subjects	13.30	.005
	A_1B_1, A_1B_2	3.25 4.25	.188	1 22	A * B	.1642	n.s.
	A_2B_1, A_2B_2	3.33 4.58					

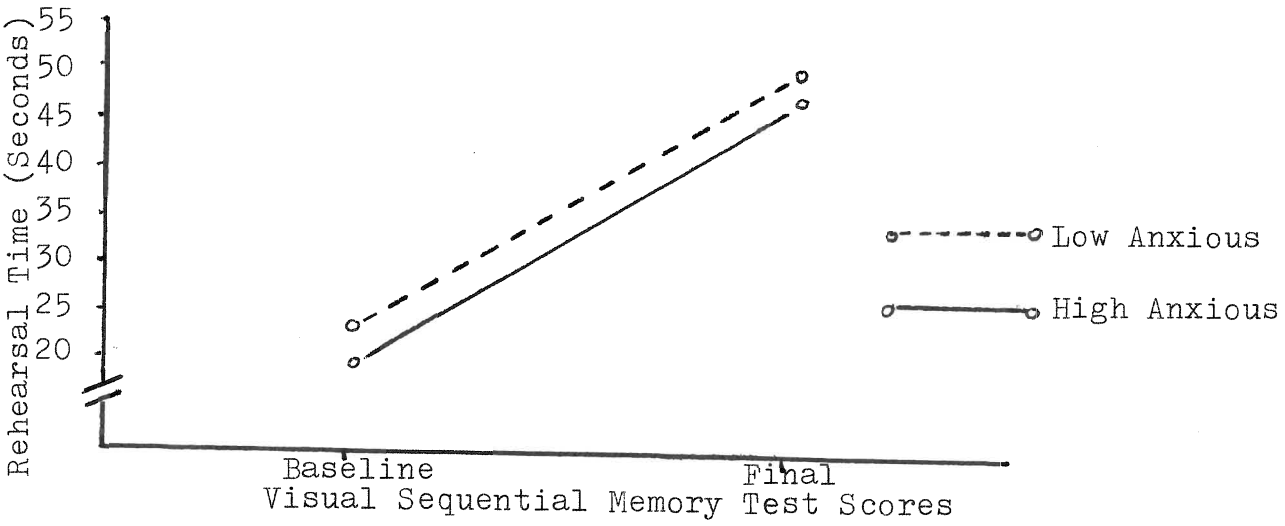
Where A * B refers to the interaction of subject factors A and B

procedures on this particular task did prove significant ($p < .005$) in increasing rehearsal time and improving recall accuracy of both high and low anxious subjects in a within group measure only.

Visual clarification of the differences which were noted from the subjects' baseline to maximum level may be attained from figure 4-1 below. Although the low anxious group scored somewhat better on both counts, the slope of the lines of both groups are very similar. This is indicative of gains made, with respect to rehearsal time in a learning condition, as being nearly identical for both the low and high anxious groups.

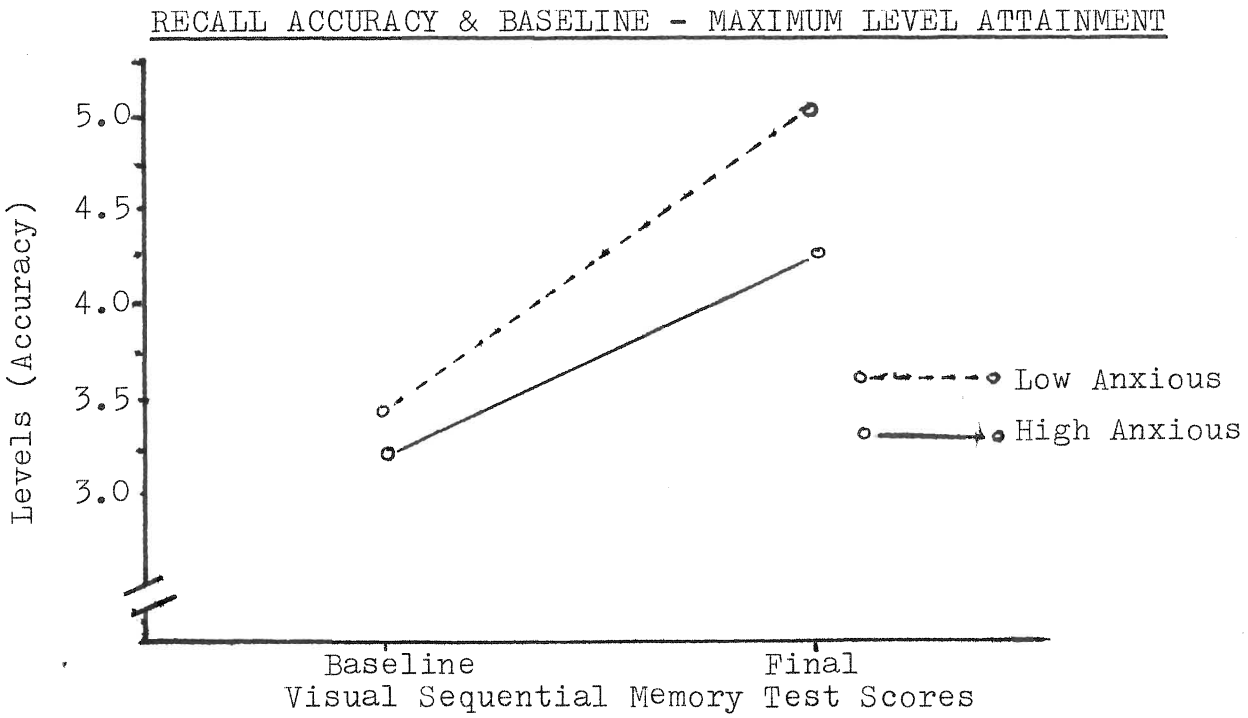
Figure 4-1

REHEARSAL TIME & BASELINE - MAXIMUM LEVEL ATTAINMENT



The graphing of differences attained in response accuracy as a result of initiated training procedures are shown in Figure 4-2. There is not an existing significant difference of the starting or end points between the low and high anxious group, even though the slopes differ somewhat. It is clear that in the learning behaviour condition, the recall accuracy

Figure 4-2



was improved greater for the low anxious subjects (reflected by the reaching of a higher mean level) but not significantly so.

Concern may be expressed with respect to the experimental design which was implemented to measure the recall accuracy and baseline establishment to maximum level attained by each subject. This concern would be based on the fact that the baseline was determined according to the subject's highest correct response level prior to the introduction of training. When training was introduced, the subject continued attempts until he erred on two of three, or three of three trials at a particular level. The lack of consistency in design for establishing the baseline (one error only) and the maximum level attained (three opportunities to achieve two correct responses) forms the basis of this argument.

To satisfy these concerns, the data was reanalysed using only the first attempt at each level that subjects progressed to

following the treatment. Hence, both the baseline and the maximum level attained by a particular subject were derived on the success of first trial basis only.

A one way repeated measures ANOVA was used for the high anxious subjects (see results in Table 4-2) and low anxious subjects (see results in Table 4-3). As noted, the level of significance in change of mean recall accuracy is $p < .01$ ($F = 42.31$, D.F. = 1,11) for the high anxious students and $p < .01$ ($F = 31.88$, D.F. = 1,15) for the low anxious students.

Table 4-2

ONE WAY ANALYSIS OF VARIANCE - RECALL ACCURACY/HIGH ANXIOUS GROUP

	Means	Mean Square	D/F	F	P
Baseline Final	3.417 5.083	16.667	1, 11	42.308	.01

Table 4-3

ONE WAY ANALYSIS OF VARIANCE - RECALL ACCURACY/LOW ANXIOUS GROUP

	Means	Mean Square	D/F	F	P
Baseline Final	3.438 5.125	22.781	1, 15	31.880	.01

(Tables 4-2 and 4-3 refer to a first trial basis only for the baseline and treatment data).

The analyses show a significant increase in performance ($p < .01$) for both the low anxious and high anxious groups. Comparing a first trial only basis for measure to a two correct out of three attempt measure of the high anxious students (N=12), five subjects attained identical performance, two attained lower maximum level and five attained a higher maximum level. For the low anxious subjects (N = 16), ten attained identical performance and six attained superior performance on a first trial basis of measure only. It appears that regardless of which experimental design one employs in analysing the baseline and treatment data, a significant improvement in performance was registered by both the low anxious and high anxious students with respect to learning behaviour following the introduction of treatment by the experimenter.

(B) DID THE HIGH ANXIOUS GROUP EVIDENCE MORE TRANSFER OF INDUCED TRAINING IN THE LEARNING CONDITION TO THE POSTTEST RESULTS (RESPONSE CONDITION) THAN THE LOW ANXIOUS GROUP?

The intent of this analysis is to determine if a significant difference exists in the transfer of analytic learning behaviour (induced in the training procedures outlined previously) between the high anxious and low anxious subjects to response behaviour. Again, a two factor (high/low anxiety) x two factor (pretest/posttest results) repeated measures ANOVA was employed in two domains (response latency and response accuracy. Table 4-4 following is inclusive of the derived values.

Similar to the analysis in Table 4-1, the posttest scores within the two groups were significantly improved over the pretest scores (response time $p < .01$, response accuracy $p < .025$). Since the posttest criteria were a consistent measure to the

Table 4-4

TWO WAY ANALYSIS OF VARIANCE
(HIGH ANXIOUS/LOW ANXIOUS - PRETEST/POSTTEST)
WITH RESPECT TO RESPONSE BEHAVIOUR

		Means	Mean Square	Degrees of Freedom		F	P
Response Time	A_1, A_2	19.17 21.04	42.00	1 22	Between Subjects	.370	n.s.
	B_1, B_2	16.53 23.67	611.76	1 22	Within Subjects	9.03	.01
	A_1B_1, A_1B_2	15.12 23.21	10.89	1 22	A * B	.1607	n.s.
	A_2B_1, A_2B_2	17.94 24.13					
Response Accuracy	A_1, A_2	4.13 3.83	1.02	1 22	Between Subjects	.505	n.s.
	B_1, B_2	3.58 4.38	7.52	1 22	Within Subjects	6.03	.025
	A_1B_1, A_1B_2	3.84 4.17	.52	1 22	A * B	.417	n.s.
	A_2B_1, A_2B_2	3.33 4.33					

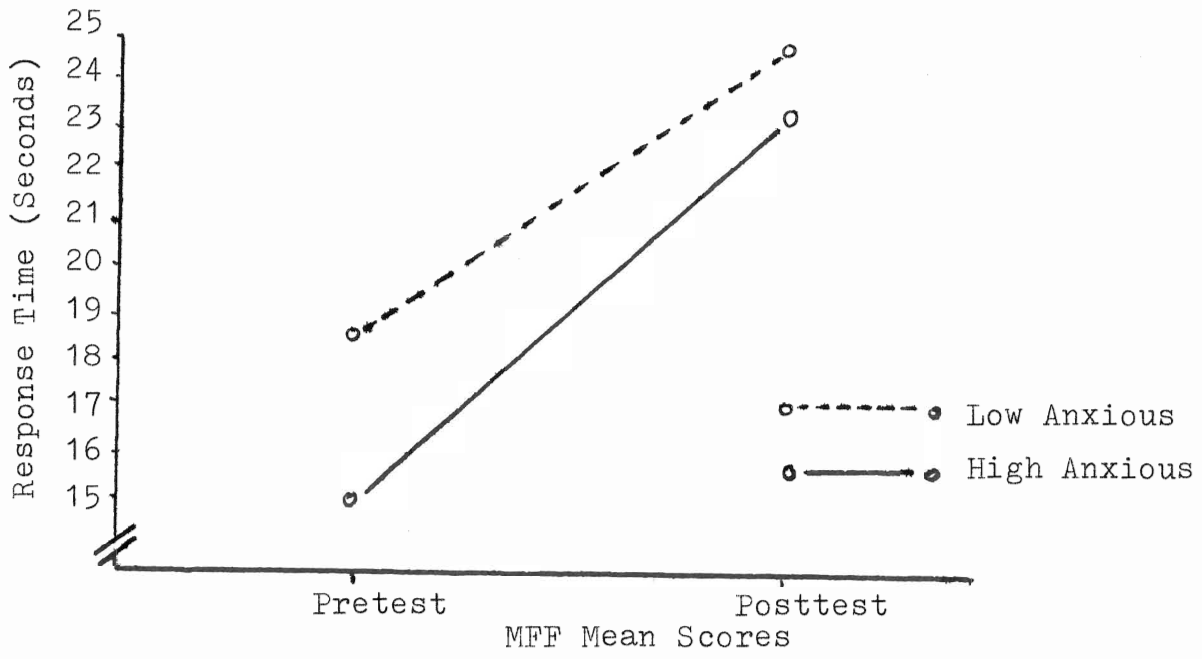
Where A * B refers to the interaction of subject factors A and B

pretest criteria, it is assumed that the interjected training procedures accounted for the significant difference that was found to exist. However, it is also to be noted that the comparative scores of the low anxious subjects were not significantly different from those of the high anxious subjects (as per the corresponding F-value of "between subjects" and "A * B", p is nonsignificant). This leads to the proposition that transfer of the analytic learning behaviour to response behaviour is significant within the groups (at minimum, $p < .025$), but does not differ significantly between the high and low anxious students in this experiment.

Examination of the graph sloping in Figure 4-3 illustrates that improvement in response time was registered by the high anxious subjects at an increased rate. This suggests that this particular group was trained to respond more slowly, although the difference between their improvement and that of the low anxious subjects was nonsignificant. Both posttest measures were significant, however, from the pretest on a "within group" score ($p < .01$).

Figure 4-3

RESPONSE TIME AND PRETEST/POSTTEST RESULTS



(C) RESPONSE ACCURACY - HIGH ANXIOUS SUBJECTS (PRETEST - POSTTEST COMPARISON

A final measure which should be listed involves the response accuracy of the high anxious students on the MFF pretest and posttest results. A one way ANOVA regarding this measure produced a different perspective than those previously considered. The accuracy modality refers to the number of correctly identified items in the pretest and posttest conditions. As shown by Table 4-5, the increase attained as a result of the training procedures amounts to a nonsignificant difference. This indicates that, although some transfer of learning strategies was maintained in the response behaviour of the high anxious subjects, the total amount was nonsignificant (F = 1.802, D.F. = 1/11).

Table 4-5

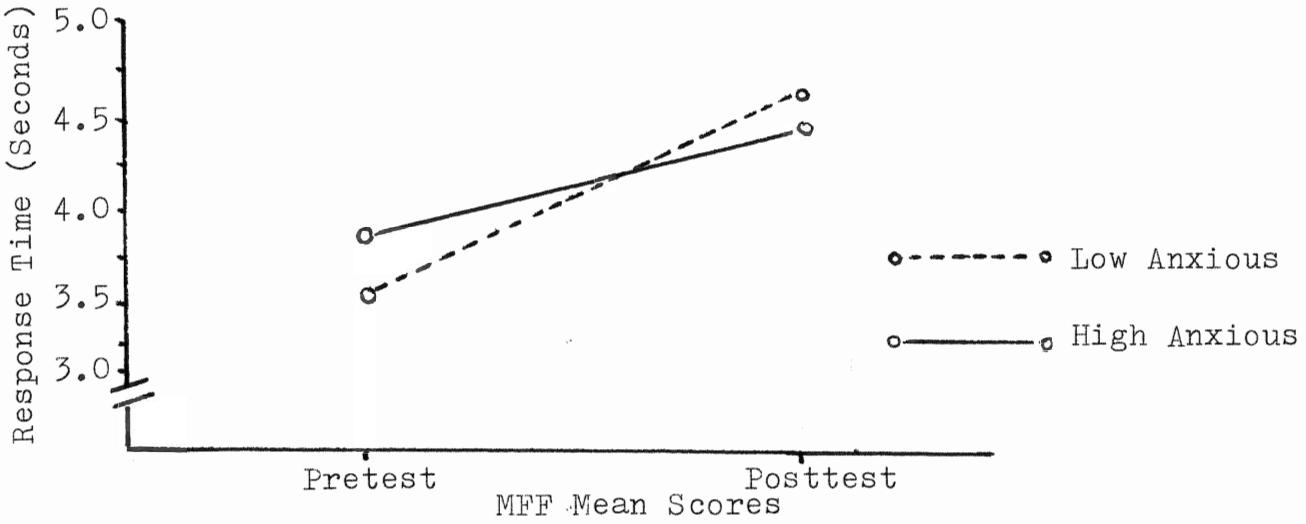
ONE WAY ANALYSIS OF VARIANCE - RESPONSE ACCURACY/HIGH ANXIOUS (PRETEST - POSTTEST MEASURE)

	Means	Mean Square	D/F	F	P
Pretest Posttest	3.83 4.42	2.042	1 11	1.802	n.s.

Comparison of the two graphs (Figure 4-4) illustrates the noted difference in achievement by the high anxious and low anxious subjects. Clearly, the latter group experienced a greater effect of accuracy transfer from the learning strategy condition to the response condition, although the difference is nonsignificant. This is shown in Table 4-4 by A * B (the F-value on a "between subjects" comparison is .505 - a non-significant difference).

Figure 4-4

RESPONSE ACCURACY AND PRETEST/POSTTEST RESULTS



As a final statement, although there was a desired change experienced by both groups on measures of response time and accuracy, the high anxious subjects experienced significant proportions only in the former dimension ($p < .025$). The low anxious subjects, on the other hand, showed significant generalization from the learning condition to response behaviour for both latency and accuracy (at a minimum level of $p < .025$). Generalization of strategic learning behaviour to response behaviour was determined via comparison of pretest and posttest response scores. The posttest measure was derived immediately pursuant to interjected training procedures (in the learning behaviour mode).

CHAPTER V - GENERAL DISCUSSION

The experiment described has produced interesting results in several areas. Its initial intent was to examine the relationship between a child's level of anxiety and his/her performance in the area of intellectual problem solving. Associated research determined the transfer of strategic learning behaviour to the response condition of both high and low anxious subjects.

(A) HYPOTHESIS I (THE ANXIETY - IMPULSIVE/REFLECTIVE RELATIONSHIP

Based on the findings, the relationship between high anxious grade four students (mean age 10.18 years) and impulsive behaviour is determined to be nonsignificant. Therefore the initial hypothesis outlined in Chapter I requires rejection. There are several competing explanations which should be considered as possible determinants of this conclusion. First is the limitation of the study itself. There was no overlap between the two subject groups as all subjects were found in either the upper or lower scoring areas of the C.A.S. (Gillis, 1980). Although this group division was justifiable based on the instrumentation employed, members of the high anxious group largely fell in the upper norm region (only two of the twelve high anxious subjects significantly deviated from the norm). In addition, the sample

selection and size varied somewhat from that which was used to derive the C.A.S. norms.

The properties of the C.A.S. are sound with respect to reliability and validity, yet as a precise measure of anxiety, the generality of the self-report questionnaire hinders its psychometric ability. The lack of significant difference regarding impulsive performance of high anxious and low anxious subjects bears this fact out. Spielberger (1977) has considered trait anxious testing devices (similar in respect to that which was used in the present experiment) as being suspect in designating truly anxious subjects. This contention is supported by Friedman (1976) who discovered that a measure of the general personality trait of anxiety in learning disabled and normal groups was found to be unrelated to impulsivity.

(B) HYPOTHESIS II (TRANSFER OF TREATMENT FROM A LEARNED BEHAVIOUR CONDITION TO A RESPONSE BEHAVIOUR CONDITION)

The outlined hypothesis that a generalization from these two conditions would occur is accepted. As a global measurement (collapsed analysis of variance, N = 28) the difference that occurred from the pretest to the posttest situation is significant ($p < .001$ response time, and $p < .005$ response accuracy). Table 5-1 shows the significant levels which were noted, upon the division of the subjects into two separate groups. The "within" group benefits of treatment remained significant at $p < .025$ minimum (the exception being the accuracy measurement of high anxious subjects). The response latency measure evidenced a higher degree of transfer than did response accuracy.[18]

[18]The transfer of strategic improvement in learning behaviour to a response condition in this experiment was significant for (a) the low anxious subjects with respect to response time and accuracy, and (b) for the high anxious subjects with respect to response time.

Table 5-1

MEANS OF HIGH AND LOW ANXIOUS SUBJECTS

		High Anxious	Low Anxious
Pretest (Response Behaviour)			
Baseline			
Treatment (Learning Behaviour)	Rehearsal Time	20.13 45.50	23.38 37.06
	Recall Accuracy	3.25 4.25	3.33 4.58
Maximum Level	Response Time	15.12 23.21	17.94 24.13
Posttest (Response Behaviour)	Response Accuracy	3.84 * 4.17	3.33 4.33

19

* represents the only non-significant change at a minimum .025 level.

This data is consistent with other critiques of the MFF construct (see for example Brown and Quay, 1978, Kagan et al., 1966), contending that impulsively reacting children can be taught to increase their response time more effectively than improving their response accuracy.[20] Accompanying

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[19] Of particular importance is the significance related to the finding that subjects' response tendencies can be made less impulsive, in terms of response latency.

[20] As there was inherent to each of the low anxious and high anxious groups, one highly irregular response within the data of rehearsal time, rationale for a transformation may be advised. To reduce the skewing effect and provide a much more normal distribution (Acton, 1959), a log transformation would result in a significant level of $p < .001$ (from $p < .005$) in the high anxious group, and a dramatic change to $p < .005$ (from $p < .05$) in the low anxious group, with respect to rehearsal time.

this "slowing down" process there may be an increased accuracy in solution derivation, but the latency is the prime measure affected through strategic training.

An important distinction of the present experiment involves the manner of instituting trained behaviour to the subjects. It was conducted in a learning behaviour condition and hence one would expect that, as with other cognitive-behaviour modification techniques, the subjects would improve on their baseline to maximum level attained (accuracy recall), while increasing their rehearsal time. The fact that significant levels of improvement did occur in this condition is supportive of other researchers' findings (see for example Kagan, 1966, Zelniker and Jeffrey, 1976). However, with respect to the response behaviour condition, this training was not direct, but only related. Different cognitive strategies are necessary for the stimulus recall on the visual sequential memory task and the discriminatory and comparative qualities of the MFF test (Sternberg and Rifkin, 1979). One cannot necessarily assume that specific training geared for improved learned performance would transfer to response behaviour. Yet this general level strategy did transfer in the measure of response latency. This researcher accounts for this important finding on the basis of the common characteristic of a slower and more analytic (reflective) behaviour required in the rehearsal and self-testing verbal mediation strategy (learning behaviour) and the match to stimulus task (response behaviour).

(c) HYPOTHESIS III (ANXIETY/IMPULSIVE BEHAVIOUR/STRATEGY TRANSFER

The third hypothesis of this experiment contends that low

anxious subjects will evidence less impulsive behaviour and that modification of this behaviour will not be as noticeable as with high anxious subjects. This is not, however, meant to suggest that no strategic transfer would be shown by the low anxious subjects. Within this study the impulsivity of subjects taking part varies predominantly on two factors:

1. anxiety
2. developmental factors[21]

Given the mean age of the subjects involved in this experiment, (10.18 years) there is no reason to expect that the low anxious children in particular are operating at their own ceiling with respect to reflectiveness. Hence it is a reasonable expectation that the developmental argument alone will account for a degree of the improvement and transfer of behaviour in the low anxious subjects.

The initial part of this hypothesis contends that low anxious children will be less impulsive than high anxious children. Comparison of both group scores on measures of accuracy of recall and rehearsal time (learning behaviour) and response accuracy and response time (response behaviour) bears this fact out. On three of these four measures, low anxious subjects showed less impulsive tendencies (see figures 4-1 through 4-4).

It was additionally predicted that some improvement and

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[21]Other researchers (see for example Sternberg and Rifkin, 1976; Flavell, 1970; Hagen et al., 1970) have determined that the developmental level of an individual will influence his/her cognitive functioning. Relative to this, it has been previously stated that some reflectiveness will be attained through the natural maturational process of children.

transfer may occur with low anxious subjects, but it would not be as influential as with high anxious subjects. Again, the latency measures of the low anxious group did produce less or approximately an equitable amount of transfer than was evidenced by the high anxious subjects. (Compare graph slopes of high and low anxious subjects in figures 4-1, 4-3).

The hypothesis, as stated in Chapter I, would be accepted in terms of the latency measures (rehearsal time and response time) and rejected in terms of the accuracy measures (recall accuracy, response accuracy). The degree of transfer within the low anxious group was greater than expected in the accuracy measure predominantly due to the developmental argument which was previously cited. The findings related to the latency measures are particularly significant, as that measure has been quoted in this text as being a more reliable indicator of cognitive tempo than accuracy. High anxious students were found to be more reflective following training for the quality of response time only.

(D) FURTHER EDUCATIONAL IMPLICATIONS OF THIS STUDY

The results of this experiment have suggested that self-report measures of general anxiety and impulsivity as per the instrumentation employed are significantly unrelated. This is not intended as a global suggestion, however, that high anxious students will not be more impulsive than low anxious students. More accurate measures of state-anxiety have been quoted as negatively affecting information processing at two levels: (1) in using logical rules, and (2) in the use of memory recall tasks

(Gross and Mastenbrook, 1980). Additionally, high state - anxiety may interfere with short term memory and one's problem solving ability (Gross and Mastenbrook, 1980). Similarly, a child's impulsive/reflective tendencies have been linked to problem solving ability (Kagan et al., 1964). The work cited supports the contention that anxiety in specific state form will indeed impair intellectual functioning of students. As a general measure, however, this researcher's findings, in agreement with Friedman (1976), suggest that a significant relationship does not exist between anxiety and impulsive behaviour. This in itself is valuable information from a teaching perspective, as state or behavioural measures of anxiety appear to be more accurate than a trait measure.

The lack of a significant difference in the performance of the subjects is supportive of Kagan's (1966) proposition that reflective (low anxious children) and impulsive (high anxious children) do not differ in their capabilities when confronted with problem solving situations, but do so in their motivational level. Hence the differences that exist may more accurately be accountable to the application of skills to the task at hand than to the skill level itself. This implies that if sufficiently motivated, high anxious children will perform adequately on problem solving related tasks.

Another relevant finding of the present experiment involves the established relationship between learning and response behaviour in problem solving situations. Transfer of strategic cognitive processes did occur for both high and low anxious students. This implies that reflective behaviour (with respect

to rehearsal time and recall accuracy) designed for specific task improvement can be learned. In addition, this reflective quality will generalize to other similar, though not identical, academic tasks. This fact sheds some light not only on the student's attainment of the solution of a problem, but also what has preceded his/her response tendency. Effective programming or treatment procedures (in this case verbal labelling and rehearsal strategies) have been priorized. This allows for a more in-depth understanding of the quality of response rather than a strict evaluation based on one's eventual performance. The fact that anxiety-related behaviour can be modified, as determined here and elsewhere (Murphy, 1980), is also encouraging to an educator. Specific remediation techniques, as introduced in this experiment, not only may reduce anxious related reactions, but also improve the students' quality of response.[22] Impulsivity was readily modified through a basic self-concept instructional approach to learning (Purkey, 1970). The degree in which students developed and implemented their own learning strategies was completely self-determined. The experimenter suggested that defined verbal labels plus rehearsal procedures may assist the memory recall task, but the subjects themselves selected which labels to employ, (if any), and the amount of rehearsal which they felt

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[22]The experiment has shown that the higher order general strategy of reflective learning could be attained by high anxious students in terms of slowing down their response. However, it may be unreasonable to expect that this same group of students would significantly improve their accuracy without being trained in a task specific strategy.

was necessary. The result was that for both high and low anxious students, a significant improvement in performance of intellectual problem solving tasks was experienced. An appropriately trained learning strategy as such has an immediate positive influence on performance, and encourages information remembrance and maintenance over time (Engel et al., 1980). Statistically, one cannot be certain that it was the treatment by itself that altered levels of performance of the students. What is important, however, is that children had demonstrated a higher success level on problem solving tasks by using an analytic strategy. The semantic design of the strategy used represents a highly individual approach to learning. In the present era of specialized fields of instruction, findings in this experiment take on increased importance.

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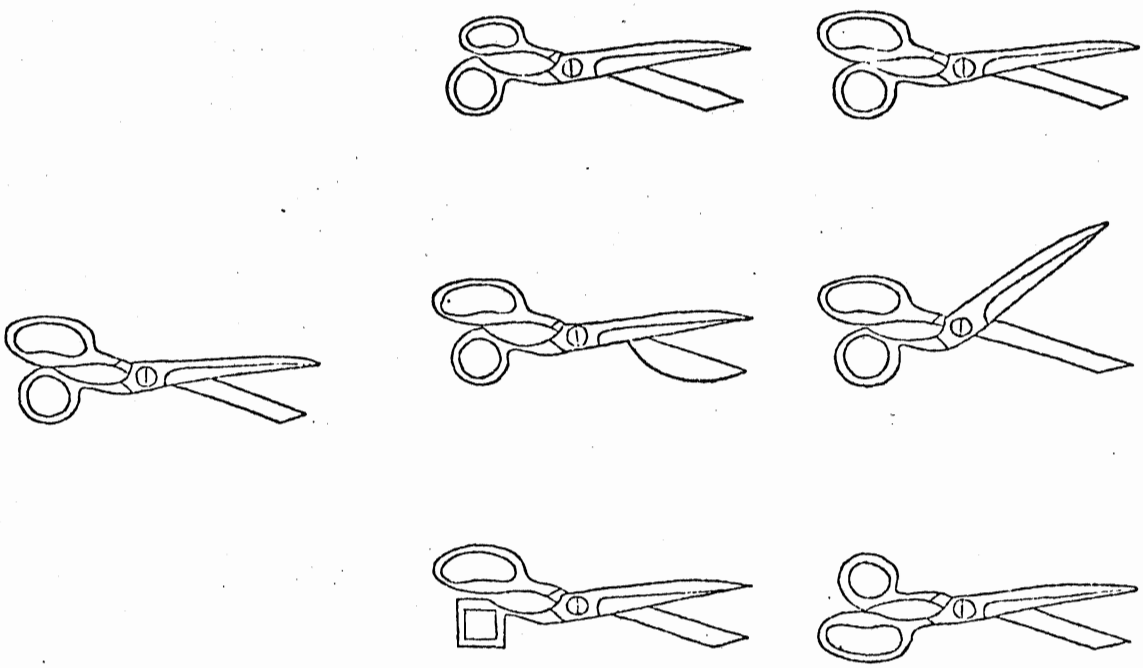
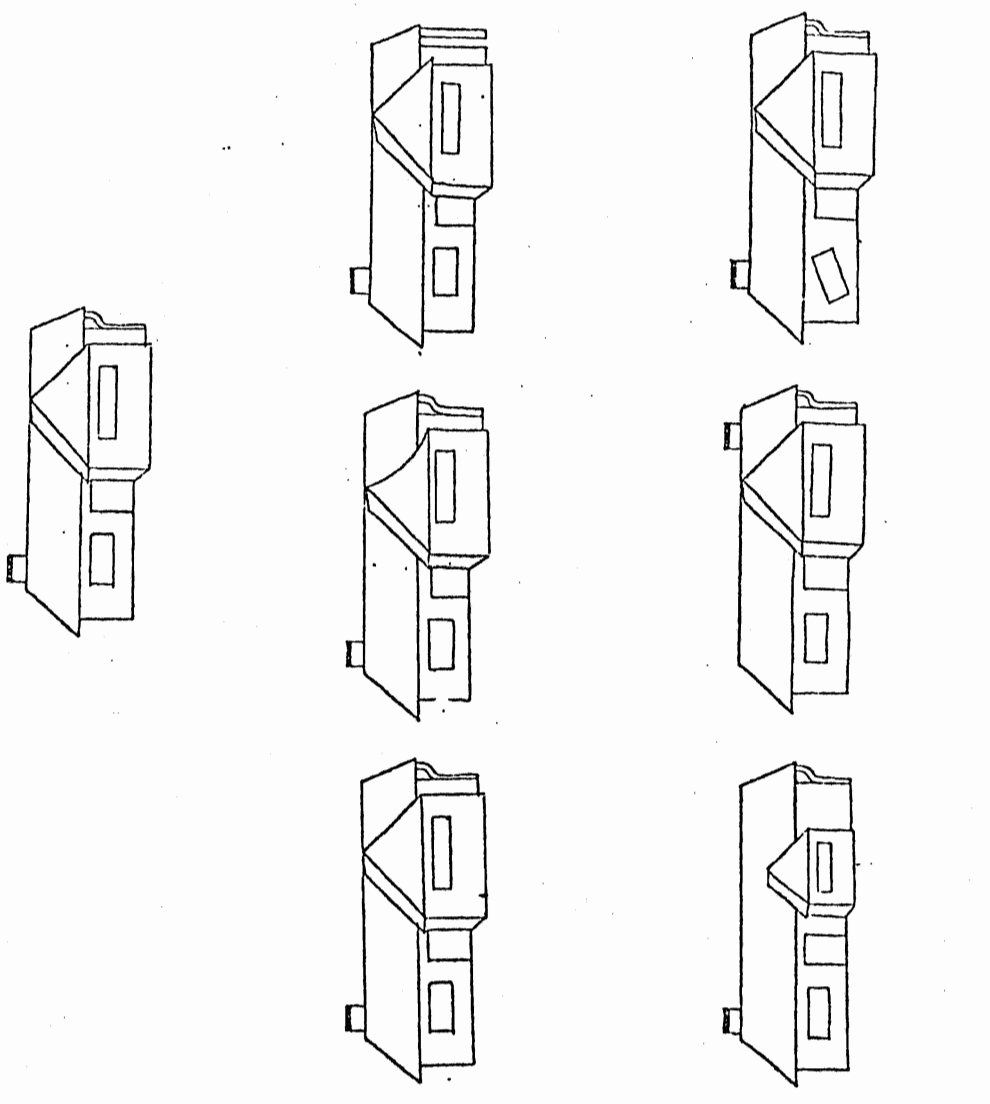
APPENDICES

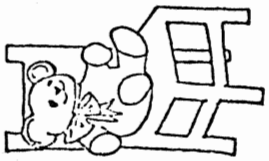
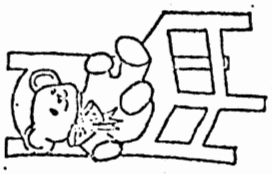
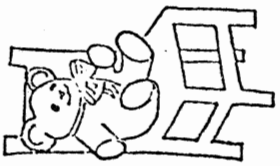
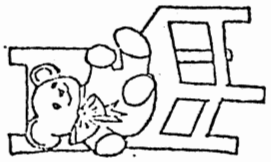
APPENDIX I

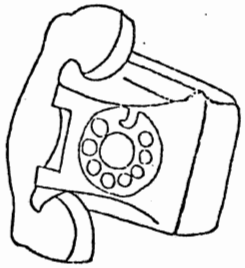
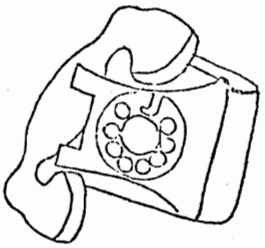
REDUCTION AND REPRODUCTION OF JEROME KAGAN'S MATCHING FAMILIAR FIGURES TEST

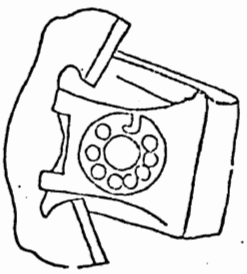


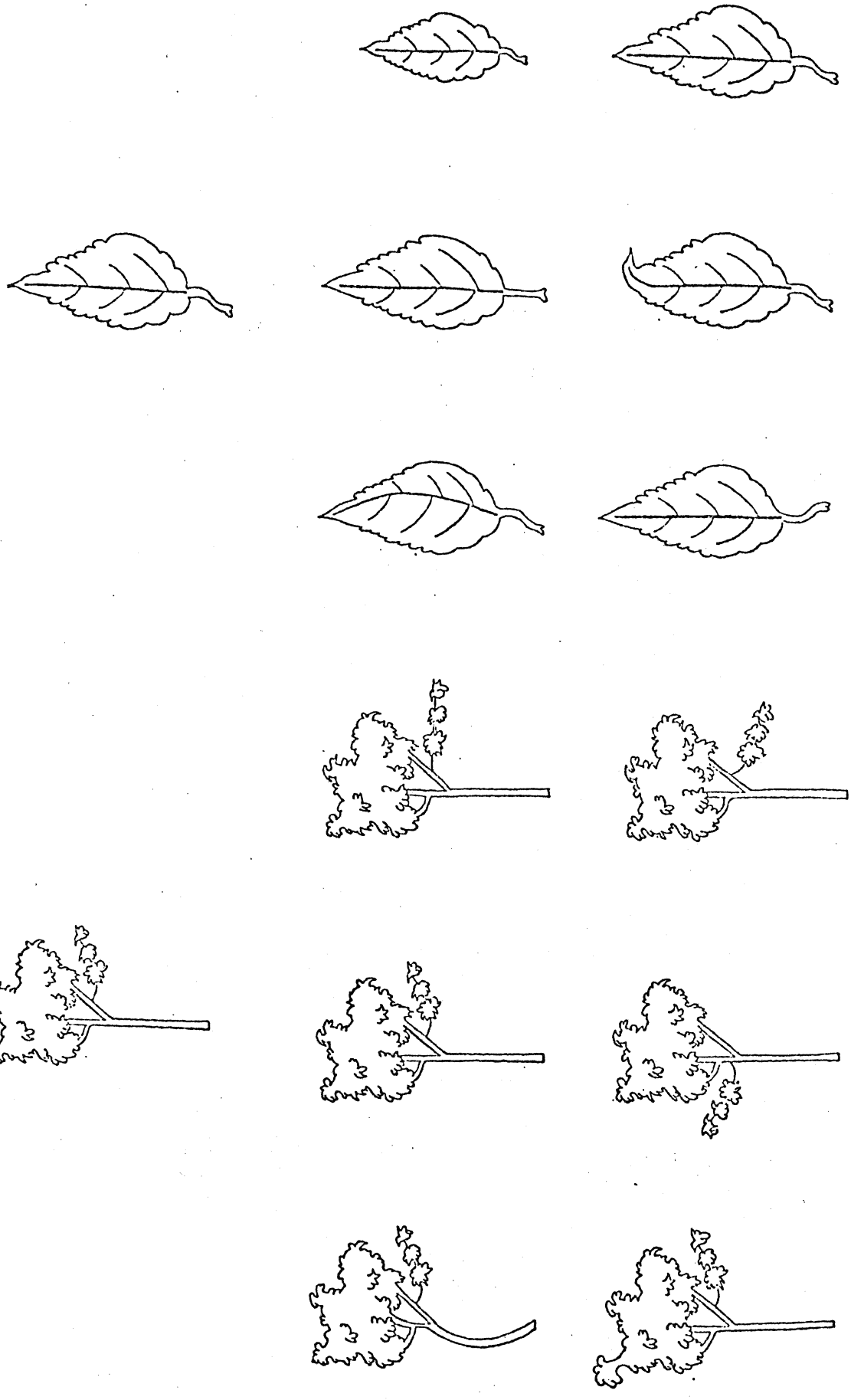


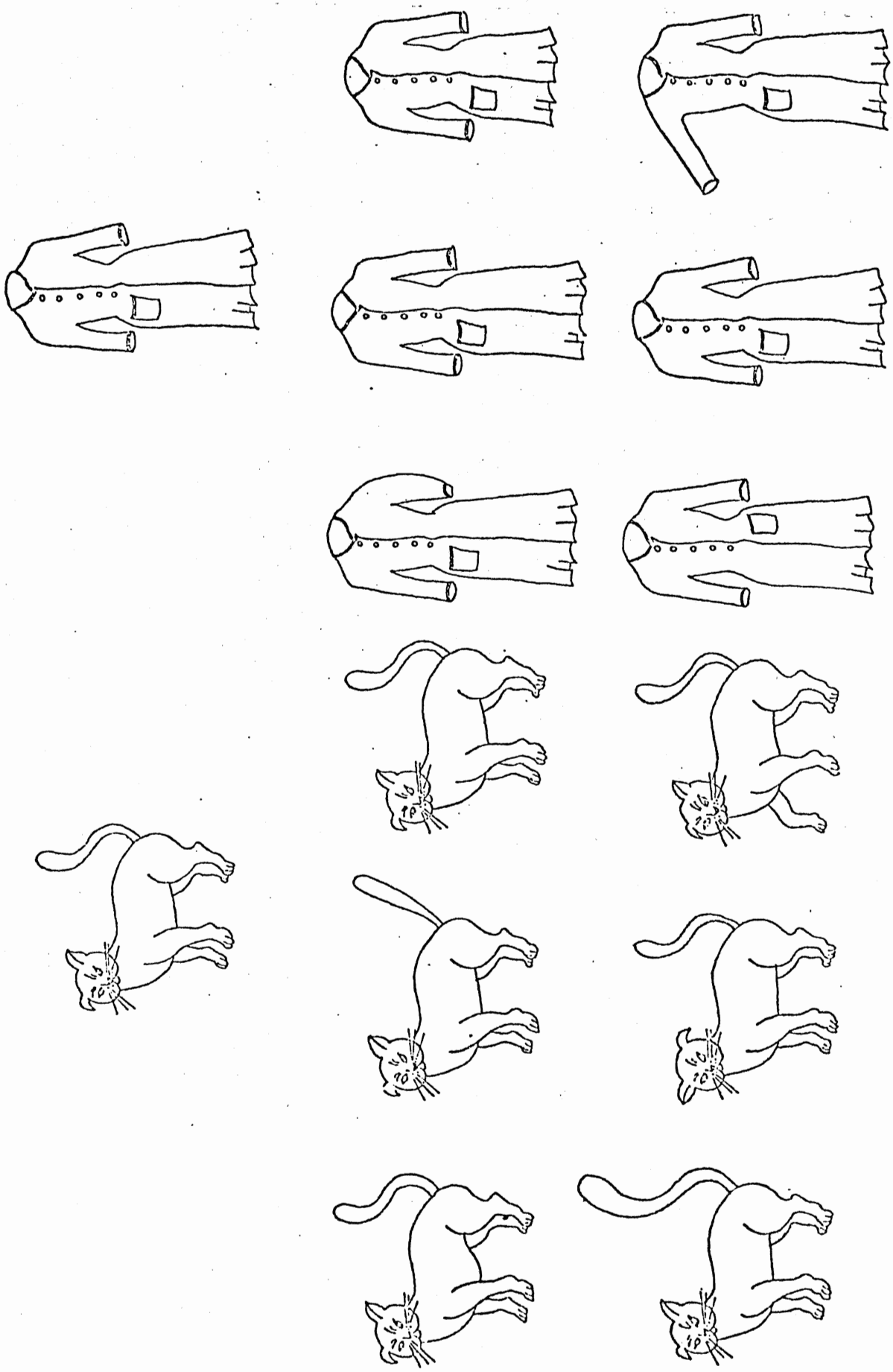


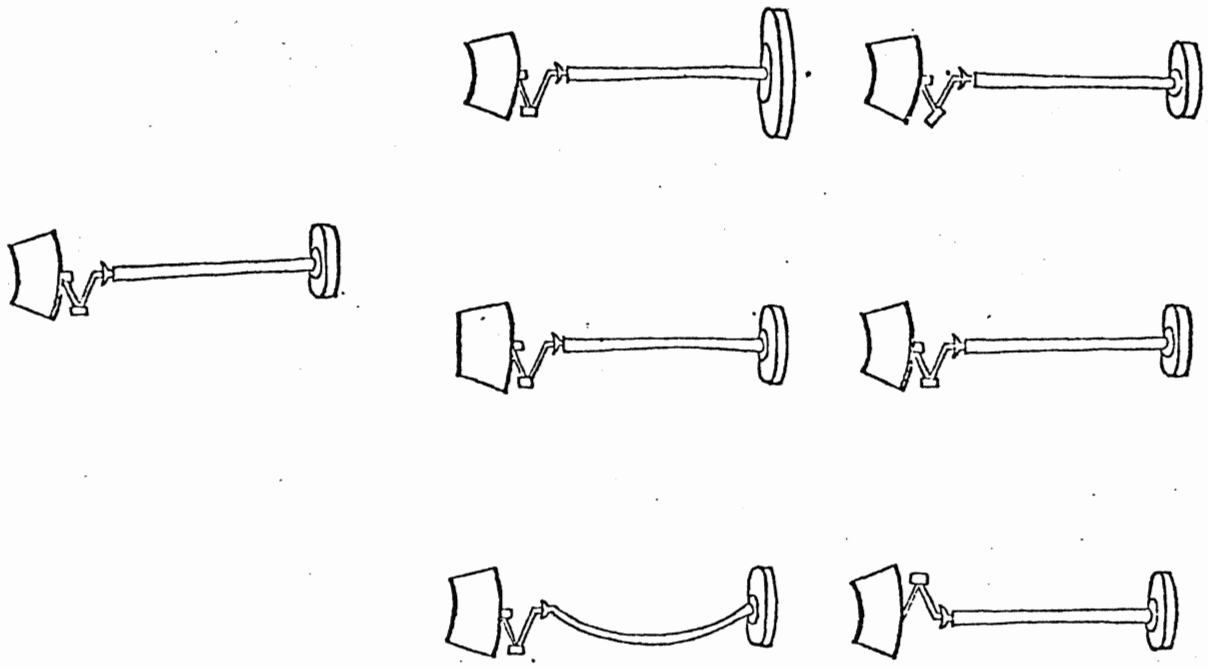





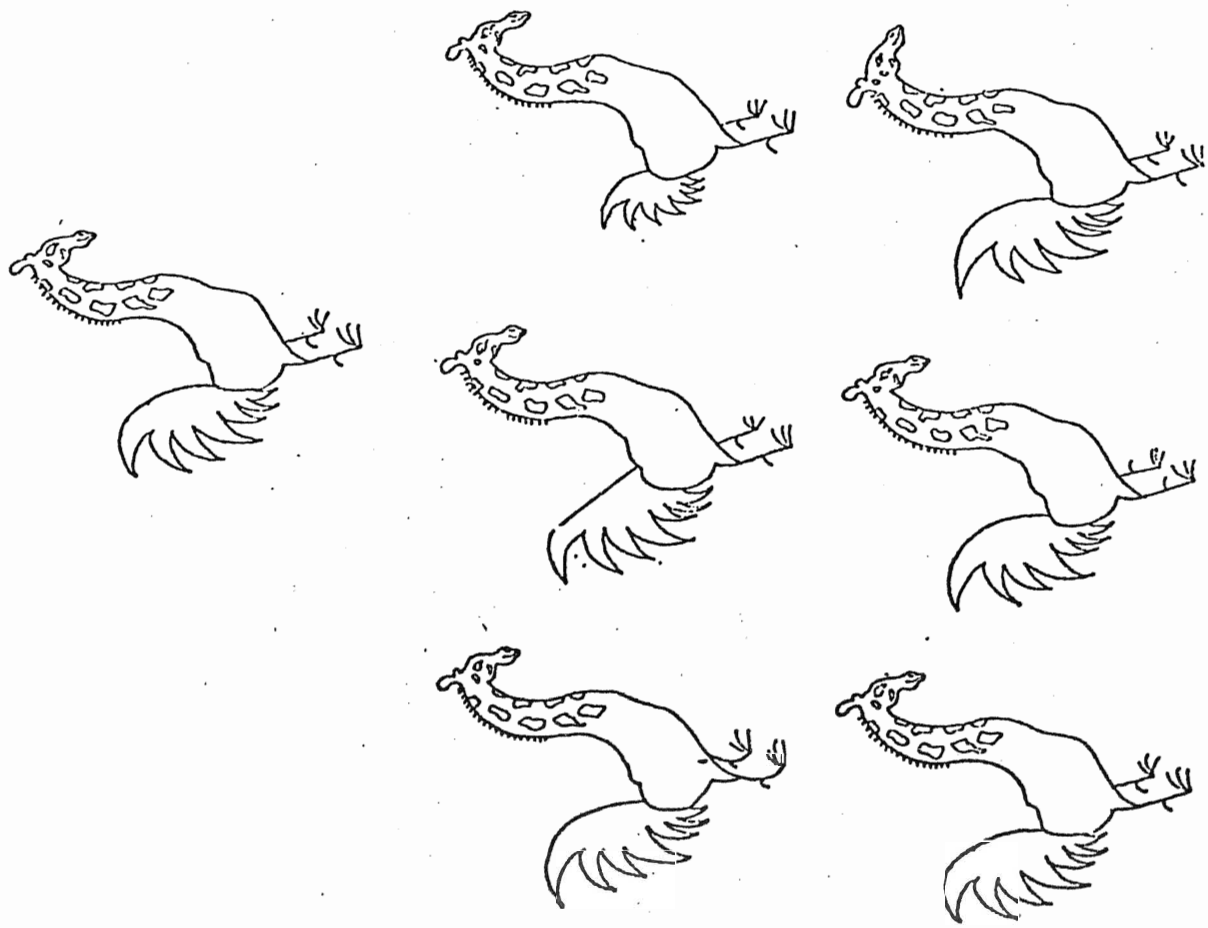



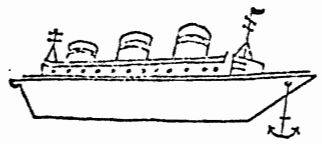


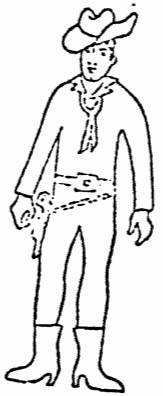



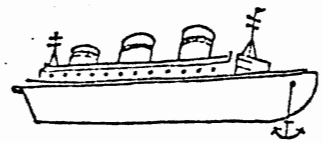


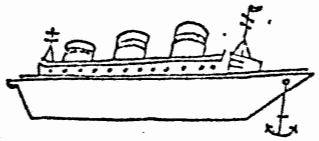


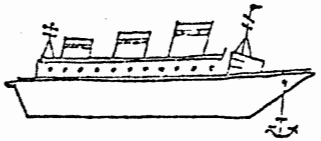


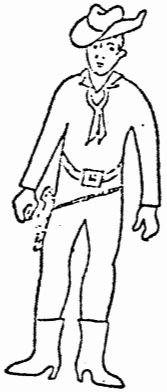


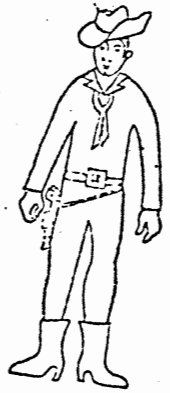


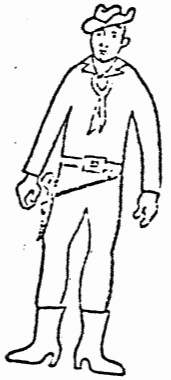


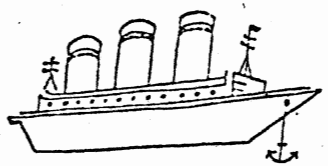


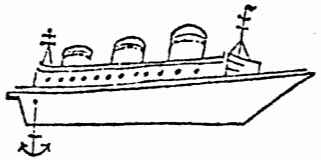


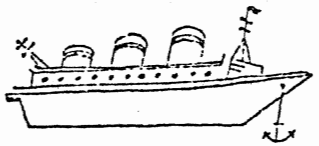


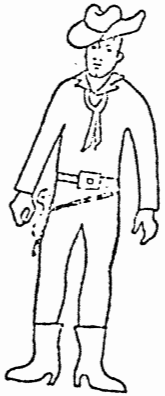


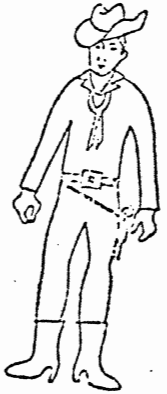


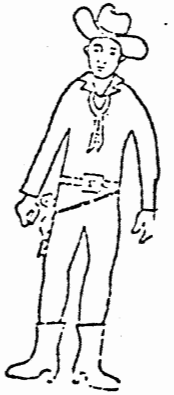






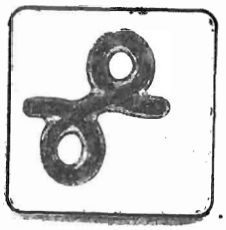


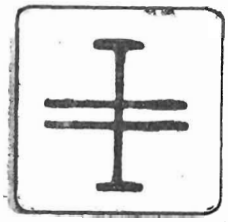


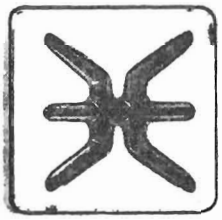


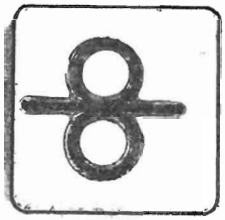
APPENDIX II

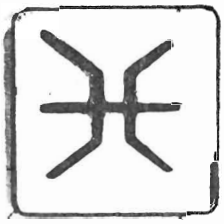
REPRODUCTION OF THE PLASTIC TILES USED IN THE VISUAL SEQUENTIAL MEMORY TEST (ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES)

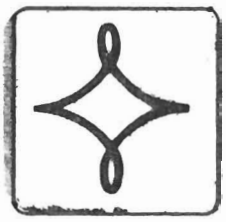


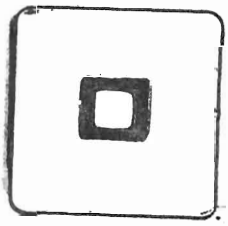


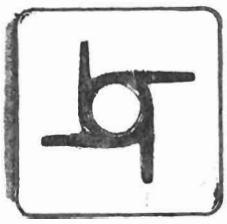


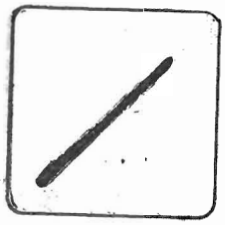












APPENDIX III

CONSENT FORMS
APPLICABLE TO THE
LINCOLN COUNTY BOARD OF EDUCATION
AND PARENTS' OF STUDENTS PARTICIPATING IN THIS EXPERIMENT

THE LINCOLN COUNTY BOARD OF EDUCATION
112 OAKDALE AVENUE, ST. CATHARINES, ONTARIO. L2P 3J9 TELEPHONE 416-685-1551

May 18, 1982.

Mr. Les Howarth,
576 Lake Street,
St. Catharines, Ontario,
L2N 4J2.

Dear Mr. Howarth:

Please be advised that the Lincoln County Board of Education's Research Approval Committee has approved your request to undertake testing to examine the relationship between anxiety and student reflective/impulsive tendencies.

School participation in the research is voluntary, and therefore it will be necessary for you to obtain the approval of individual school principals and teachers to conduct the research in their schools. I recommend that you work through Mr. Bruce Scott in this regard.

Confidentiality of schools and students must be maintained, and parental permission secured for testing of individual students. We trust that we would receive a copy of your research when it is completed.

Yours truly,

Fraser Robinson

E. Fraser Robinson,
Superintendent - Development.

EFR:dm

c.c. B. Scott

BROCK UNIVERSITY
REGION NIAGARA

College of Education

Ph: 684-7201

St. Catharines,
Ontario L2S 3A1
Canada

LDH/5/82

May 1982

Dear Parent(s):

We would like to seek permission for your child to participate in a school learning study at his/her public school. The study is important from a teaching viewpoint. Problem-solving tasks which will be given have been used and enjoyed by similarly aged children in a number of schools on previous occasions. The nature of the material is familiar to those involved and the instructions for its use are easy to understand. It will require about forty-five minutes of your child's time, and care will be taken to avoid interference with academic lessons.

The results of the study will provide a general picture of how children go about solving new problems and therefore no individual records will be kept on any child. Parents of participating children will have access to their child's results if desired.

The Lincoln County Board of Education and the principals of the schools involved
have previously reviewed the material and authorized its usage. All testing procedures will be conducted in conjunction with the College of Education at Brock University. I am available to discuss the instrumentation itself and its related usage with any parents who wish to do so. Your signature in the appropriate space below will provide the necessary consent to carry out the above stated procedures. Your co-operation and punctual return of this form with your child to school the next day is appreciated.

Sincerely,

Les Howarth
St. Catharines, Ont.
934-7219

I hereby give permission for my child to participate in the educational study described above.

Date.....

Child's Name (Please Print).....

Parent's Signature.....

LDH/5/82

APPENDIX IV

REPRODUCTION OF THE CHILD ANXIETY SCALE
(GILLIS, 1980)
AND THE SCORING KEY

Picture	Question
butterfly	Do you do very well in most things you try, or do things often go wrong for you? If you do very well in most things you try, mark an X on the red circle or, if things often go wrong for you, mark an X on the blue circle.
spoon	Do people think you are often bad, or do people think you are usually good? If people think you are often bad, put an X on the red circle. If people think you are usually good, put an X on the blue circle.
cloud	Can you answer quickly, or do others seem to answer before you? If you answer quickly, put an X on the red circle or, if others seem to answer before you, put an X on the blue circle.
fish	Are you lucky or unlucky? If you are lucky, put an X on the red circle. If you are unlucky, put an X on the blue circle.
apple	Do you think only some people like you, or do you think everybody likes you? If you think only some people like you, put an X on the red circle or, if you think everybody likes you, put an X on the blue circle.
mushroom	Do people ever say you talk too much? If people ever say you talk too much, put an X on the red circle or, if people never say you talk too much, put an X on the blue circle.
mouse	Can you do things better than most boys and girls, or not as well as most boys and girls? If you can do things better than most boys and girls, put an X on the red circle or, if you cannot do things as well as most boys and girls, put an X on the blue circle.
moon	Do you seem to be always having accidents, or do you never have accidents? If you seem to be always having accidents, put an X on the red circle or, if you never have accidents, put an X on the blue circle.
bottle	Do you feel cheerful and happy most of the time, or not much at all? If you feel cheerful and happy most of the time, put an X on the red circle. If you do not feel cheerful and happy much at all, put an X on the blue circle.
kite	Do things sometimes seem too hard for you, or do things never seem too hard for you? If things sometimes seem too hard for you, put an X on the red circle or, if things never seem too hard for you, put an X on the blue circle.
book	Do you think you have to sit too long in school? If you think you have to sit too long in school, put an X on the red circle or, if you do not think you have to sit too long in school, put an X on the blue circle.
leaf	Do you usually finish your work on time, or do you need more time? If you usually finish your work on time, put an X on the red circle. If you need more time to finish your work, put an X on the blue circle.
owl	Are other children always nice to you, or do they sometimes pick on you? If other children are always nice to you, put an X on the red circle. If other children sometimes pick on you, put an X on the blue circle.
lion	Can other people do things better than you, or not as well as you? If other people do things better than you, put an X on the red circle or, if other people do not do things as well as you, put an X on the blue circle.
cake	Are you afraid of the dark, or are you not afraid of the dark? If you are afraid of the dark, put an X on the red circle or, if you are not afraid of the dark, put an X on the blue circle.

sun	Do you have just a few problems, or do you have a lot of problems? If you have a few problems, put an X on the red circle. Or, if you have a lot of problems, put an X on the blue circle.
hand	Do you think people ever say bad things about you? If you think people ever say bad things about you, put an X on the red circle. If you think people never say bad things about you, put an X on the blue circle.
flag	Are you pretty good at everything, or just a few things? If you are pretty good at everything, put an X on the red circle or, if you are good at just a few things, put an X on the blue circle.
heart	Do you always have good dreams, or do you sometimes have bad dreams? If you always have good dreams, put an X on the red circle or, if you sometimes have bad dreams, put an X on the blue circle.
umbrella	When you cut yourself, do you get scared and feel sick, or do you pay no attention to it? If you get scared and feel sick when you cut yourself, put an X on the red circle. Or, if you pay no attention to it if you cut yourself, put an X on the blue circle.

SAMPLE CAS ANSWER SHEET

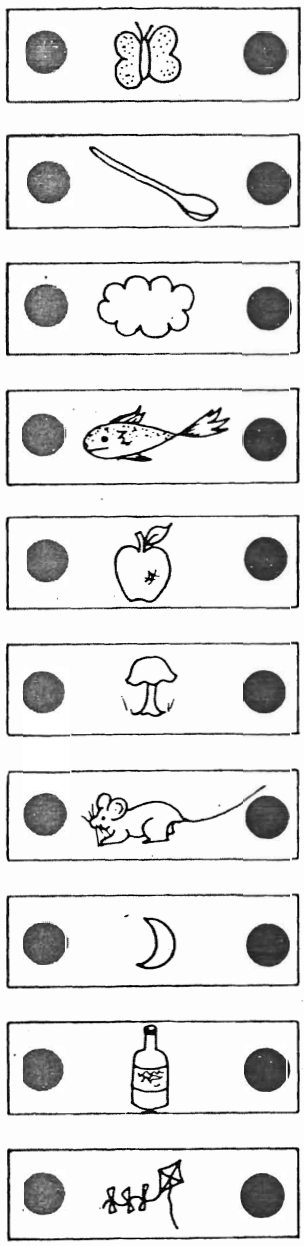
ipat

CAS—Level 1

Name: First _____ Last _____ Boy [ ] Girl [ ]

Age _____ Grade _____ Teacher _____ School _____ Date _____
Years Months

Start here

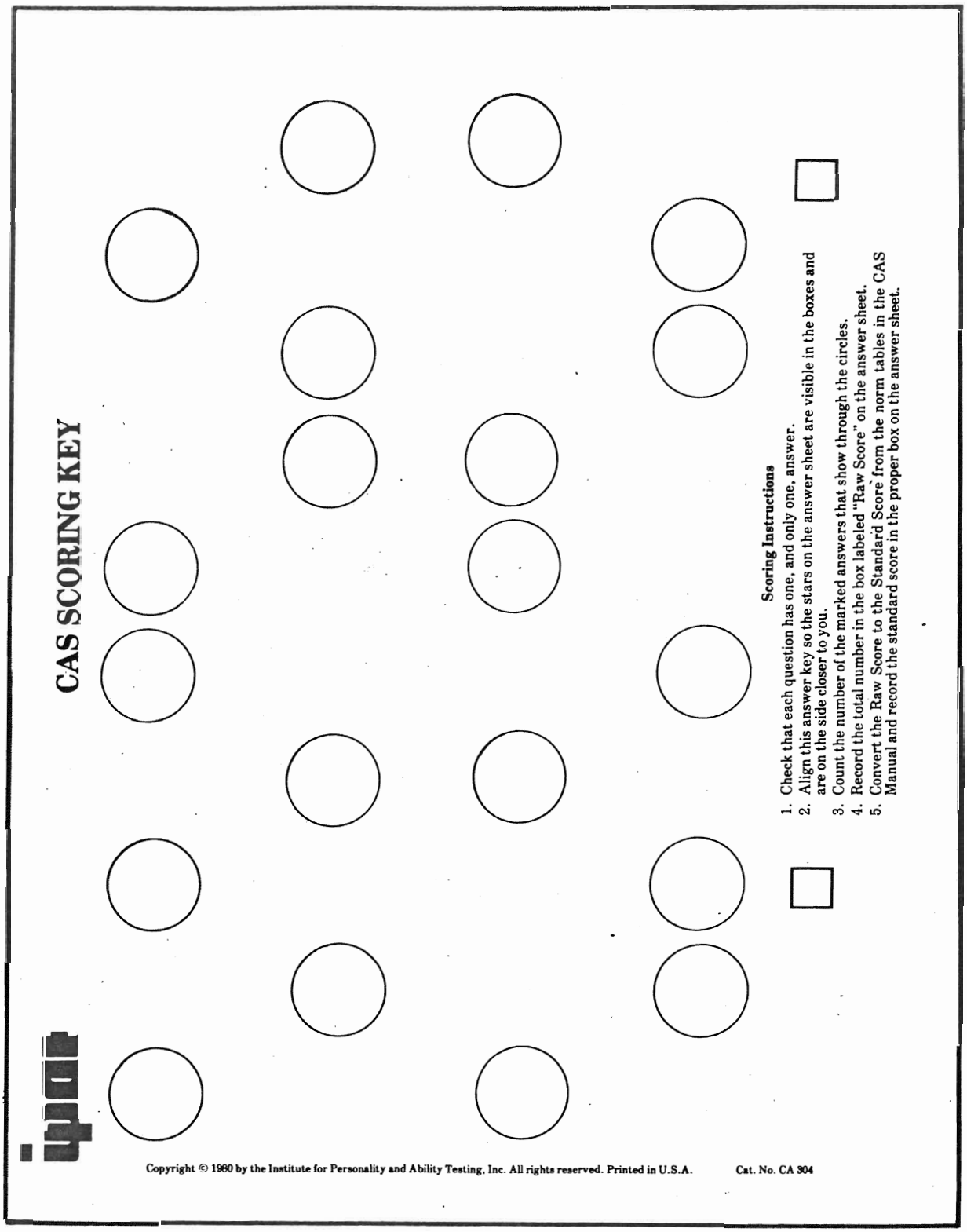


Raw Score

Standard Score

The black circles represent the blue circles on the original answer sheet; the gray circles represent the red circles on the original answer sheet.

SAMPLE CAS SCORING KEY



Scoring Pattern

Left responses: 2, 5, 6, 8, 10, 11, 14, 15, 17, 20

Right responses: 1, 3, 4, 7, 9, 12, 13, 16, 18, 19